The influence of grazed grassland in productivity on Indian grassland (Bilaspur, Chhattisgarh)

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Abstract- The grazed grasslands of the India are an important resource as it contributes environmentally, economically but also in social development of the country. In the current growing industrialization the effective use land and continuous degradation in the grassland productivity has become one of the prime concerns for the country. In this study the primary productivity of a Grazed grassland commune located at Kota of Bilaspur district, Chhattisgarh lies between $21^0$47' to $23^0$8' North latitude and $81^0$14' to $83^0$15' East longitude have been considered. A quadrate of 0.25 gm-2 is used for sampling the above ground plant parts and size of quadrate is determined by Species Area Curve Method. The grassland community comprised of 13 species (7 were grasses and 6 were non-grasses). *Bothriochloa Pertusa*, *Cynodon dactylon*, *dactyloctenium aegyptium*, and *eragrastris mutan* among the grasses and *Alternanthera sessilis*, *Alycicarpus Monilifer*, *Desmodium Trifloriun*, and *Sida cordifolia* among the non-grasses were found dominant during the study period. Results show that, the annual grass production was found to be 1305.95 gm-2/year. The non-grass production showed maximum in the month of October (53.49 gm-2) and minimum in the month of June (2.80 gm-2). The annual non-grass production was found to be 430.84 gm-2 /year. This study informed about the natural ecosystem and the primary productivity helps to the earlier balanced state. Our study provides a interesting future direction that how, human and climate changes affect the net productivity and biodiversity of grazed grassland community.

Index Terms- Grazed grassland, Below ground, Live green, Biomass, litter

I. INTRODUCTION

In the current global developing market and climatic issues, conservation of grasslands has become one of the major concern for ecological as well as the environmental point of view. As the grassland is ecologically fragile and sensitive to the climate changes (Qi et al. 2012). Anderson et al. (2006) concluded that the role of grazing in regulating the function and structure of the grassland ecosystem. The influence of grazing on plant and soil mainly effected from the animals trample (Yates, 2000), that do not allow grassland to attain their fullest development. Grazing also associated with the organic content like Nitrogen (N), Phosphorous (P), Potassium (K), and pH values in soil (Yates, 2010). Almost 50% of the worlds terrestrial land base is grazed by domestic livestock (Havstad 2008).

This has insightful effect on the composition structure physiognomy and minerals status of the grasslands. The impact of grassing on the productivity, mineral status has been explained by studying the biomass structure and minerals status of the grazed grassland of district Bilaspur during 2012-2013.

Our study is an attempt to evaluate the impact of grazing on biomass, by answering some of the important questions such as; how does the climatic change throughout the year affects the productivity of grazed grassland, its structure and functioning with respect to climatic variations? As the Indian grassland commune are entirely depending upon the climatologically factors and various biotic interferences. Grassland were most vital part in the worlds productivity long before. Human activities have mainly affects the grassland all over the world and much of the area has been converted in to agricultural land. As a result of excessive human interference it is difficult to locate virgin grassland in our country. The grassland plants mostly consist of a number of animal and perennial grasses mixed with legumes and fob's with the advent of the mansoon. In June fairly good number of special starts their growth either through seeds or sporting rhizomes.

Organic matter accumulation rate in plant tissue with surplus of respiratory utilization refers to net primary production. The total weight of the living component present at any given time in the ecosystem accounts for the biomass. The customary approach in ecologically works is to evaluate production as a parameter of productivity as a functional aspect of the ecosystem has attracted much attention during recent year's and much information is available now on primary production & turnover parameters for grassland of tropical & temperate regions. Tiwary and Sing (1981) highlighted the important contributions of grassland communities' production in India.

Litter decomposition plays an vital role in terrestrial ecosystem for maintaining productivity and to regulates the availability of nutrients needed for plant growth. Basic processes of decomposition in their study namely as biological action withering and leaching are the key factor affecting decomposition (Kar 2013).

II. MATERIALS AND METHOD

Climate condition:

The study was carried out on Bilaspur, which is located at central part of India. The climatic climax was sub tropical with an moderate temperature variation for most of the year a part from the summer from March to June which can be externally

hot. From the soil, climate environment department the rainfall data was collected around 1300 mm of rain mainly in the monsoon season. The soil of the experimental site was found to be moderately acidic (pH = 6). However, the phosphorous content at the experimental site remain almost constant throughout the year, varies between 0.02 to 0.03 percent. Similarly, carbon percentage at the site was around (0.46%), percentage of nitrogen in the soil ranged between 0.07 to 0.36% and available potassium ranged between 53 to 92 ppm.

Sample collection and identification:

Plant sampling:

The survey was conducted in grassland for above ground biomass in a monthly sampling in a random way. Each sampling location roughly around 25 x 25 x 30cm in area, for three parts of the grassland and hereafter all these three areas were referred as the sites. The method used for collecting the data was harvest method 3 Quadrates. The clipping of above ground parts has been done closed to the ground with the help of a scissor and objects were separated species wise.

Soil sample:

Composite soil samples were collected every month.

Productivity study:

Calculation of the various parameters of biomass structure and function has been collected from the sampled plant materials.

Biomass and Primary Productivity:

Productivity for each category of plant materials namely as live green, standing dead,

depth in cm	pH	Conductivity	Organic carbon (C) (%)	Available phosphorus (P) (ppm)	Available potassium (K) (ppm)
0 to 10	5.65	0.31	0.41	0.42	78.40
10 to 20	6.40	0.23	0.50	0.25	66.50
20 to 30	6.75	0.21	0.48	0.96	50.10

litter and below ground parts were calculated by summing up of the positive increments of concerned biomass in gm-2/year. Similarly, calculation of litter disappearance (LD) was done by subtracting the total net productivity of litter during the year from the difference between final and initial litter biomass (Golley, 1965). Below ground disappearance (BGD) was calculated from the difference between peak below ground biomass and succeeding minimum below ground biomass (Sims and Singh, 1971). Total disappearance was obtained by adding litter disappearance and below ground disappearance.

III. RESULTS AND DISSCUSSION

The green biomass of grasses sedges increased 3.20 gm-2 in April to a peak value of 72.95 gm-2 in October. The total above ground standing dead biomass in site was minimum 2.36 gm-2 in July & maximum 80.15 gm-2 in November. The total above ground biomass (green dead) in site increased from a minimum of 31.31 gm-2 in July to 118.50 gm-2 in November .The litter in site increased in September & reached its peak of 68.20 gm-2 in November the belowground biomass of both the sites decreased initially in the rainy season & than increased in site the peak value was 256.40 gm-2 in January.

Table- 2: Biomass ((gm^{-2}) of different species during the study period.

Month	Live green			Standing dead	Litter	Above ground		Below ground	Total Biomass
	Grasses	Non grasses	Total			Lg + Sd	Lg + Sd + L		
Oct.	43.10	52.60	95.70	27.10	46.10	122.80	168.90	140.50	309.40
Nov.	37.95	37.10	75.05	80.15	68.20	155.20	223.40	158.20	381.60
Dec.	31.60	39.85	71.45	35.20	46.15	106.65	152.80	131.89	284.69
Jan.	37.80	38.70	76.50	59.67	50.10	136.17	186.27	256.40	442.67
Feb.	21.15	44.67	65.82	37.50	44.0	103.32	147.37	106.59	253.96

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Mar.	5.59	39.10	47.69	44.69	60.85	92.38	153.23	99.67	252.90
Apl.	3.20	7.54	10.74	33.39	50.10	44.09	94.19	48.20	142.39
May.	2.15	4.30	6.45	40.50	19.33	46.95	66.28	97.69	163.97
Jun.	8.30	2.70	11.00	47.90	--	58.90	58.90	143.59	202.49
Jul.	30.10	27.80	57.90	2.36	--	60.26	60.26	152.20	212.46
Aug.	67.40	33.20	100.60	2.97	--	103.57	103.57	78.40	181.97
Sep.	70.50	49.26	119.76	5.10	21.94	124.86	146.80	200.45	347.25
Oct.	72.95	45.35	118.30	23.20	36.76	141.50	178.26	254.96	433.22
Total	**434.79**	**422.17**	**856.96**	**439.69**	**433.58**	**1296.65**	**1740.23**	**1868.74**	**3608.97**

The total biomass of site increased 44.09 gm-2 in April to 141.05 gm-2 in October where as it fluctuated throughout the year. The below ground/ above ground ratio in site ranged

Results of the study for the live green biomass (grasses, non grasses and total live green) of the Grazed site and the green biomass did not follow any trend. It attained a peak during January and minimum in month of July. The standing dead biomass increased from July (2.36 gm-2) to October (23.20 gm-2 and the peak in the month of November (80.15 gm-2). Minimum standing dead biomass was recorded in the month of July (2.36 gm-2).

Total above ground biomass is the sum total of live green biomass and standing dead biomass. It was found to be minimum in the month of April (44.09 gm-2) and maximum during November (155.20 gm-2).

The litter biomass of the community did not showed any trend. Thereafter the value showed a declined trend minimum in September (21.94 gm-2) and the maximum value (68.20 gm-2) in November. The litter was totally absent in the month of June, July and August.

The sequence of monthly above ground biomass values showed similar trend to that observed in case of live green biomass values. The below ground biomass values decreased from January (256.40 gm-2) to April (48.20 gm-2) and the minimum biomass of grazed grassland is 48.20 The sequence of monthly above ground biomass values showed similar trend to that observed in case of live green biomass values. The below ground biomass values decreased from January (256.40 gm-2) to April (48.20 gm-2) and the minimum biomass of grazed grassland is 48.20 gm-2 and the maximum biomass reached in 254.96 gm-2 in October. The total biomass of the community ranges from 142.69 gm-2 to 446.69 gm-2. The maximum biomass was observed in January and minimum in the month of April.

The non-grass production showed maximum in the month of October (52.44 gm-2) and minimum in the month of June (2.70 gm-2). The annual non-grass production was found to be 422.17 gm-2/year. The total live green production showed their minimum and maximum value during May (6.45 gm-2 and October (118.30 gm-2). Out of the annual net live green production (856.96 gm-2/year) 50.72% was contributed by grasses and 49.28% by non-grasses. The standing dead production was found to be 439.69 gm-2/year.

IV. DISCUSSION

In view of the present findings, the grassed sites is under heavy grassing pressure and will lead to a further degradation of these elements in future but looking to the huge nutrient reservoir in the soil, it appears that these nutrients will not affect the productivity of these grassing land, at least for a few year in future.

The annual net above ground production of this Grazed grassland, it was observed that the present value showed 434.79 gm-2/year. The litter production of the community was evident from January to May and from September to December. No litter production was observed during June, July and August. This may perhaps be due to rapid decomposition of litter.

The rain fall, atmospheric temperature and soil condition were found to be suitable for the growth and development of all species so that September exhibited peak value. Onwards the amount of rain fall, atmospheric temperature along with the soil condition might not be favourable for the growth of vegetation as a result of which a gradual declined in green biomass was observed till to the end of the sampling period.

REFERENCES

[1] Anderson R. H., Fuhlendorf, S. D., Engl D. M. (2006). Soil nitrogen availability in tall grass prairie under the fire-grazing interaction. Rangeland Ecology and Management, 59: 625-631.

[2] Dadsena B.P. and Jaiswal M.L. (2014). A study of primary productivity on grassland of Bilaspur District (Chhattisgarh) India. IJSRP Vol. 4 Issue - 6. June 2014 : 1-4.

[3] Choudhary N. and Narayan R. (2013). Exotic invasive Ageratum conyzoides L. in Indian dry tropic's: A preliminary investigation of it's biomass allocation pattern and plant traits Journals of plant development and science 5(3) : 249-254.

[4] Havstad, K M. 2008. Mongolias rangelands: s livestock production the key to the future? Frontiers in Ecology 71:1040-1049.

[5] Kar P.K. (2013)- Life form and primary production of an Indian grassland community, 1(2), 8-16.

[6] Qi, J., J. Chen, S. Wan, and L. Ai. 2012. Understanding the coupled natural and human systes in Dryland East Asia. Environmental Research Letters 7:015202.

[7] Tyagi & sing P (1988) - Pasture & forage crops research a state of knowledge report pub mnmt soc, Jhansi India.

[8] Tiwari, S.C Tewary, C.K. and J.S. Singh (1981). *Progress of Ecology in India. P-3-28. In: A. Singh and P. Wahi (eds.) Souvenir.* Ecology and resource management in the tropics. ISTE Bhopal University, Bhopal.

[9] Van Dyna, G.M., F.M., Smith, R.L.Casplewid and R.G.Woodmansea (1978), Analysis and synthesis of grassland ecosystem dynamics. In J.S.

Singhand B.Gopal (ed.): climpses of ecology, International scientific publication Jaipur, India.

[10] Yates, C. J., Norton, D.A., Hobbs, R. J., (2000). Grazing effects on plant cover, soil and microclimate in fragmented woodlands in south-western Australia: Implication restoration. Austral Ecology, 25: 36-47.

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