EFFECT OF GRAZING ON SPECIES COMPOSITION AND PRODUCTIVITY OF GRASSLANDS OF GODDA DISTRICT, JHARKHAND

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The present investigation deals with "Effect of Grazing on Species Composition and Productivity of Grasslands of Godda District, Jharkhand". The thesis contains the results of studies made on phytosociological studies i.e. species composition, life-forms, biological spectrum, importance value index, biomass, primary productivity, turnover and energetics of important grassland species on protected and grazed grasslands of Simara, Godda District, Jharkhand ($23^0$40' to 25^0 18' north latitude and $86^0$28' to $89^0$57' east longitude). The field observations and samplings were carried out at regular intervals of one month on protected and grazed grasslands from June 2014 to June 2015.

Grasslands refer to vegetation community predominated by graminoids i.e., grasses and grass like plants.The major families found in the grasslands are Poaceae, Cyperaceae, Fabaceae and Asteraceae. The grasslands of the temperate regions also have high richness of Caryophyllaceae, Gentianaceae, and Rosaceae. The grasslands not only function as a major producer biome, but also serve as habitat to a variety of micro and macro fauna. The grasslands of the world are also under the threat of developmental activities and other land use changes resulting in habitat fragmentation, frequent fires and reduction in biodiversity.

The Prairies of North America, Pampas of South America, the African Savannas, the Veldts of South Africa, the Caucasian Steppe, the Terai grasslands, the Alpine meadows of Himalaya and Shola grasslands of Western Ghats are some of the unique grassland of the world. The grasslands globally have been classified into Tropical Savannas, Temperate grasslands and Steppes. The Savannas are characterized by large areas of grasslands with scattered trees found in the tropical region, whereas the temperate grasslands are extensive stretches of tall grasslands in the temperate regions, while the Steppes refer to extensive stretch of short grasslands found in arid and semi-arid temperate high altitude regions.

Dhadabgao and Sankarnarayan (1973) in their book “The Grass Cover of India” had identified the following five broad types of grass cover found in India:

- Sehima - Dichanthium grasslands which are spread over the Deccan plateau, Chota Nagpur plateau and Aravallis, with an elevation range of 300-1200 m above mean sea level.

- Dichanthium - Cenchrus - Lasiurus grasslands which are spread over norther n parts of Gujarat, Rajasthan, Aravalli ranges, south-western Uttar Pradesh, Delhi and Punjab with an range of 150-300m above mean sea level.
- Phragmites - Saccharum - Imperata grasslands which are spread over the Gangetic plains, Brahamputra Valley and the plains of Punjab, with an elevation rangeof 300-500 m above mean sea level.
- Themeda - Arundinella grasslands spread over the foothills and lower hills of Manipur, Assam, northern parts of West Bengal, Uttarakhand, Himachal Pradesh and Jammu and Kashmir in the elevation range of 350-2000 m above mean sea level.
- Temperate - Alpine grasslands- spread across the Himalayan States and the temperate high altitude areas of Nagaland, Manipur and Western Ghats above an altitude of 2000 m above mean sea level. Subsequent to the work by these authors, several explorations and extensive surveys have been made to assess the grass cover and community classification in Indian grasslands. However, such efforts have not been made in a coordinated manner. Similarly, there has not been any attempt to revise the initial classification of grassland communities of India.

Grasslands and their grazers provide some of the most compelling examples for studying the relationship between diversity, productivity, and disturbance. In this study, we analyzed the impact of grazing-induced changes in species composition and community structure upon the productivity of a grassland in the Godda district of Jharkhand. Researcher studied the community composition of the grazed and ungrazed situations, and determined biomass and above-ground net primary production (ANPP) of the three treatments during the year. Grazed plots had higher species richness and diversity than the exclosure. Grazing resulted in the replacement of some cool-season, tussock grasses by warm-season, prostrate grasses. The species composition component resulted in lower ANPP once the structural component was controlled, probably due to the shift to warm-season phenology and prostrate habit. Our findings contrast with a similar experiment carried out in the neighbouring Flooding Pampa region, which suggests that the relationship between grazing and community structure and function is difficult to generalize.

Species Composition of Protected and Grazed Grasslands

The maximum number of species was recorded 11 on protected and 25 on grazed grasslands in rainy season. The life-forms studies indicated a thero-hemicryptophytic flora. Percentage of therophyte was found higher on grazed i.e., 56.00% as compared to that of protected grasslands (36.36%). Frequency, relative frequency, density, relative density, abundance, basal cover, relative dominance and importance value index of the species present on protected and grazed grasslands in rainy, winter and summer seasons were studied by quadrat methods. The maximum importance value index of *Aristida cyanantha* was recorded 99.14 and 73.09 (rainy), 121.47 and 165.60 (winter), 106.83 and 160.56 (summer) on protected and grazed grasslands, respectively.

Primary Productivity of Dominant Grassland Species

The biomass of grassland species on protected and grazed grasslands was estimated by harvest method. The primary productivity was determined by method given by Singh and Yadava (1974).

The maximum aboveground standing live biomass of the total community was found to be 1357.08 g/m^2 and 665.75 g/m^2 in October on protected and grazed grasslands, respectively. The annual net production of the aboveground standing live part of the total community was recorded 1366.26 g/m^2/yr and 728.78 g/m^2/yr on protected and grazed grasslands, respectively. The turnover of aboveground standing live part of the total community was recorded 1.01 and 1.09 on protected and grazed grasslands, respectively.

The maximum aboveground standing dead biomass of the total community was found to be 991.21 g/m^2 in March on protected and 836.51 g/m^2 in February on grazed grasslands. The annual net production of the aboveground standing dead part of the total community was recorded 954.20 g/m^2/yr and 825.84 g/m^2/yr on protected and grazed grasslands, respectively.

The turnover of aboveground standing dead part of the total community was recorded 0.96 on protected and 0.98 grazed grasslands, respectively.

The highest underground biomass of the total community was recorded to be 415.31 g/m^2 (December) on protected and 344.29 g/m^2 (September) on grazed grasslands. The annual net production of the underground part of the total community was recorded 377.37 $g/m^2/yr$ on protected and 330.41 $g/m^2/yr$ on grazed grasslands. The turnover of underground part of total community was found to be 0.90 on protected and 0.95 on grazed grasslands.

The maximum biomass of the litter for total community was recorded 187.03 g/m^2 (July) and 172.01 g/m^2 (May) on protected and grazed grasslands, respectively. The annual net production of the litter of total community was recorded 192.98 $g/m^2/yr$ on protected and 193.22 $g/m^2/yr$ on grazed grasslands. The turnover value of litter for total community was found to be 1.03 on protected and 1.12 on grazed grasslands.

The total annual aboveground production of the total community was found to be 1669.94 $g/m^2/yr$ on protected and 1352.90 $g/m^2/yr$ on grazed grasslands. Thus, grazing has reduced 18.99 per cent of the total aboveground production of the total community.

Energetics of Different Components of Dominant Grassland Species

The calorific value of different components of *Aristida cyanantha* and other species of the grassland species were estimated in different months on protected and grazed grasslands by Bomb Calorimeter.

The energy value for *Aristida cyanantha* on dry weight basis was observed 4490 cal/g on protected and 2948 cal/g on grazed grasslands. The maximum aboveground standing crop of energy was observed 9847.12 $Kcal/m^2$ (October) and 3173.17 $Kcal/m^2$ (November) on protected and grazed grasslands, respectively. The underground standing crop of energy ranged from 566.13 $Kcal/m^2$ to 1510.01 $Kcal/m^2$ on protected and 297.41 $Kcal/m^2$ to 1168.68 $Kcal/m^2$ on grazed grasslands.

The annual net production value of total community was 7624.98 Kcal/m^2 on protected and 4389.20 Kcal/m^2 on grazed grasslands. The grazing had reduced 42.43 per cent of production in terms of Kcal/m^2/yr in comparison to protected grassland.

The energy conserving efficiency of *Aristida cyanantha,* other species and total community was estimated in rainy, winter and summer seasons on protected and grazed grasslands. The annual energy conserving efficiency of total community was recorded 1.545 per cent on protected and 0.208 per cent on grazed grasslands.

On the basis of above observations it is concluded that protection increased the production of grasslands but decreased the number of grassland species. Hence, grazing is essential for better biodiversity of grassland ecosystem.

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Recent studies indicate that plant species richness and primary productivity of grasslands may be limited by seed availability. However, it is not known how widespread this limitation is, whether it is affected by disturbance, or which mechanisms underlie any disturbance effect. We tested for seed limitation and explored the role of litter accumulation in explaining effects of recent grazing history on seedling establishment, species diversity (richness and evenness), and plant productivity in a subhumid grassland ecosystem in Texas, USA.
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Grazing significantly affects the composition of herbage: it reduces abundance of some tall species and contributes to increasing the number of herbs. Overgrazing leads to thinning of herbage and to dominance of inedible and surface-foliaceous herbs [9, 10]. Deserted grasslands of the semi-desert zone are characterized by a two-member, three-member and four-member communities, called spotted or â€œmottledâ€ steppes. Interacting Effects of Productivity and Grazing on Grassland Carabid Beetles. INTRODUCTION. Half of the worldâ€Ÿs terrestrial land base is grazed by domesticated livestock (Havstad 2008). As a disturbance, grazing by large herbivores has direct effects on vegetation, such as selective mechanical removal of aboveground biomass, trampling of plants, and compaction of soil (Holland and Detling 1990; Rietkerk et al. 2000). Grassland community structure and function is consequently changed by cattle grazing (Holland and Detling 1990; Fleischner 1994).Â Understanding patterns of grassland biodiversity is important because biodiversity can contribute to maintaining ecosystem function and economic value (West 1993; Kennedy et al. If the species composition of the grazed and mowed sites differs then it could be a potential driving factor for carbon sequestration differences. Therefore, to answer the initial question, first we needed to investigate the coenological composition of grazed and mowed areas. We assumed that the two sites have similar species composition, because we wanted to start the mowed and grazed experiment on the carbon balance on sites having similar species composition. We predicted that if the two sites will have similar species composition then the species richness, the abundance of species, species...