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ESTIMATION OF ABOVE GROUND BIOMASS OF THE THREE SITES (GRAZED SITE, PROTECTED SITE AND SEED SOWN SITE) FOR COMPARING THEIR PRODUCTIVITY IN KASHMIR VALLEY

AFSHAN ANJUM BABA, SYED NASEEM UL-ZAFAR GEELANI, ISHRAT SALEEM, MOHIT HUSAIN*, PERVEZ AHMAD KHAN, AKHLAQ A. WANI AND SUHEEL AHMAD

Faculty of Forestry
Sher-e-Kashmir University of Agricultural
Sciences and Technology of Kashmir,
BENHAMA, GANDERBAL-193201 (J&K) INDIA
*Corresponding Author
E-mail- mohit.husainchf@gmail.com

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ABSTRACT

The plant biomass for protected areas was maximum in summer (1221.56 g/m^2) and minimum in winter (290.62 g/m^2) as against grazed areas having maximum value 590.81 g/m^2 in autumn and minimum 183.75 g/m^2 in winter. Study revealed that at Protected site (Kanidajan) the above ground biomass ranged was from a minimum (1.11 t ha^{-1}) in the spring season to a maximum (4.58 t ha^{-1}) in the summer season while at Grazed site (Yousmarag), the aboveground biomass varied from a minimum (0.54 t ha^{-1}) in the spring season to a maximum of 1.48 t ha^{-1} in summer seasonandat Seed sown site (Badipora), the lowest value of aboveground biomass obtained was 4.46 t ha^{-1} in spring while as the highest (7.98 t ha^{-1}) was obtained in summer.

Figure : 00 References : 17 Table : 01

KEY WORDS : Above ground biomass, Below ground biomass, Grasslands Productivity.

Introduction

Out of the known 136 terrestrial ecoregions, extraordinary examples of the world's diverse ecosystems, 35 are grasslands. About 4,500 relatively large protected areas comprise at least 50% grassland; protected grasslands cover approximately 4 million km^2 or 3% of the total land area, which represents just 7.6% of the total grassland area. Grasslands store 34% of the global stock of carbon in terrestrial ecosystems, while forests store 39% and agro-ecosystems 17%. Unlike tropical forests, where vegetation is the primary source of carbon storage, most of the grassland carbon stocks are in the soil. Grasslands are particularly captivating for viewing game animals and for safari hunting. People get attracted to the large mammals, birds, diverse plant life, and generally open-air landscapes of grasslands[17].

Major characteristics of the grasslands: species richness and composition, plant life-forms, vegetation structure and dynamics, and primary productivity, intimately interact with herbivore grazing, and play a critical role in determining biodiversity and ecosystem functioning in the grasslands[6,12]. The diversity of annual plant life-forms is determined by the interaction between grazing and small-scale spatial and temporal variation in primary productivity, operating mainly on the less abundant species in the grassland community[11].Grasslands are among the largest ecosystems in the world, covering 30% of the Earth's surface. They are found in every region of the world; Sub-Saharan Africa and Asia having the largest total area under grasslands, 14.5 and 8.9 million km^2, respectively. Commonly, they occur in the semi-arid zones (28% of the world's grasslands), followed by humid (23%), cold (20%), and the arid zones[13] (19%).Grasslands contribute directly to the livelihoods of more than 800 million people. They are precious sources of goods and services, such as food and forage, energy and wildlife habitat; and also provide carbon and water storage and watershed protection for many major river systems.

TABLE -1 : Aboveground and belowground biomass of herbs (t ha^{-1}) at Grazed site (Yousmarag), Protected site (Kanidajan) and Seed sown Site (Badipora)

Study Site	Biomass	Spring	Summer	Autumn
Grazed site (Yousmarag)	AGB	0.54	1.48	1.09
	BGB	0.85	1.56	1.34
Protected site (Kanidajan)	AGB	1.11	4.58	1.95
	BGB	0.63	2.93	0.85
Seed Sown site (Badipora)	AGB	4.46	7.98	4.81
	BGB	2.82	6.17	2.42

They are important for *in situ* conservation of genetic resources. Most commonly, grasslands are used to feed the livestock. From cows and buffaloes, sheep and goat herds, to horses and mules, grasslands support large numbers of domestic animals, which constitute the sources of meat, milk, wool, and leather products for us. They also support large numbers of wild herbivores that depend on grasslands for breeding, migratory, and wintering habitat. Grassland biodiversity encompasses a wide range of goods useful to humans[7]. The impact of grazing on various community features and biomass of herbaceous species in the Langate Forest Division of Kashmir, during the year 2002-2003. A perusal of data reveals that the grazed areas showed low biomass values as compared to the protected ones for all the seasons. The plant biomass for protected areas was maximum in summer (1221.56 g/m^2) and minimum in winter (290.62 g/m^2) as against grazed areas having maximum value 590.81 g/m^2 in autumn and minimum 183.75 g/m^2 in winter[8]. Grasslands known for their aesthetic, biological and cultural values are being subjected to varied disturbances like grazing, moving, trampling etc. Owing to overgrazing, degradation of pastures has achieved critical dimensions all across the globe. Jammu and Kashmir with significant population of Gujjar and Bakarwal communities is facing more intense problem of grazing and consequently grasslands have degraded. Mild grazing was found to promote growth of more species in grasslands as against heavy grazing which decreases species number. However total protection from grazers also leads to decrease in species number in grasslands[1].

Materials and Methods

The Jammu and Kashmir state is located in the North-Western extremity of India between 32^{o}-172 and 38^{o}-582 North latitude and 73^{o}-352 and 80^{o}-362 East longitude with an average altitude of 1,586 meters from the mean sea level and annual precipitation of about 794.7 mm. From North to South, it extends over 640 km in length and from East to West over 480 kilometers in breadth. The total geographical area of Jammu and Kashmir is 2, 22,236 km^2 which constitutes about 6.74% of the total area of the country. The total area of Jammu and Kashmir[2,3] under grasslands is 4164 km^2. The direct field plot harvest method was used[10]. The application of this method, though more difficult and less cost effective especially in large scale mapping is traditionally the most accurate since it is based on direct field sampling. Three transects were laid hundred meters (100 m) apart from each other in order to cover more and more area, these transects were divided into two blocks. Three 1 m x 1 m quadrants were laid down per block and all herbaceous plant species were harvested. The harvested materials were placed in polyethylene bags and transported to the laboratory for identification and biomass determination. Roots of plants present in the soil were collected by digging 5 cm^2 pits up to a depth of 20 cm. The roots were then separated, collected and processed for laboratory analysis. Before laboratory analysis, all the vegetation components and roots were washed thoroughly under a jet of running water so as to remove the attached soil.Laboratory studies involved dry weight determination of all collected sub-samples of plant parts. Sub-samples of all plant parts, were weighed and oven dried to constant weight in a hot air-circulating oven at 105^{o}C. After 24 hours, samples were weighed and presented on oven dry weight basis to estimate the dry matter present.

Result and Discussion

1. Protected site

A survey of the biomass of herbaceous vegetation indicated its considerable variation in different seasons at different sites. A great difference was observed in aboveground biomass (AGB) as well as belowground biomass (BGB).At Protected site (Kanidajan), the above ground biomass ranged from a minimum (1.11 t ha^{-1}) in the spring season to a maximum (4.58 t ha^{-1}) in the summer season. The below ground biomass fluctuated from a minimum of 0.63 t ha^{-1} in the spring season to a maximum of 2.93 t ha^{-1} in the summer season (Table-1).

2. Grazed site

At grazed site (Yousmarag), the aboveground biomass varied from a minimum (0.54 t ha^{-1}) in the spring season to a maximum of 1.48 t ha^{-1} in summer season. The below ground biomass value ranged from a minimum of 0.85 t ha^{-1} registered in spring season while the maximum value of 1.56 t ha^{-1} was observed in summer season (Table-1).

3. Seed sown site

At Seed sown site (Badipora), the lowest value of aboveground biomass obtained was 4.46 t ha^{-1} in spring while as the highest (7.98 t ha^{-1}) was obtained in summer. However, for below ground biomass, the minimum (2.82 t ha^{-1}) recorded in the spring season and the maximum (6.17 t ha^{-1}) was observed in the summer seasons (Table-1).

During the present study, the highest value of biomass for all the three seasons was recorded at Seed sown site (Badipora) followed by Protected site (Kanidajan) and the least at Grazed site (Yousmarag) (Table-1). It was observed that total biomass showed a general trend increasing towards the summer season and decreasing towards the autumn season at the protected sites. The above ground biomass showed blossoming growth at protected site in the summer season. However, at other site, the above ground biomass did not describe a general trend but decreased in the growing season. At grazed site, which was more prone to overgrazing it was observed that below ground biomass was more than the above ground biomass as compared to other sites, same trend was also observed[14].Plant biomass is an important measure of ecosystem functioning. The magnitude of impact that livestock grazing may have on a plant community is dependent upon intensity of grazing. Heavy grazing markedly reduces vegetation cover compared to light grazing. Also, as our results indicate, aboveground biomass decreased under heavy grazing intensity, whereas, belowground biomass showed a slight increase. Since, biomass allocation ratio to root increasing is an adaptive response of plants to grazing; this change was reflected in the higher below ground biomass at the overgrazed sites. These views are supported[5,16]. However, workers[4,9,15] opine that grazing intensity has no connection with change or increase in the root biomass.

Grazing in the grasslands of these tree sites of Doodh–Ganga range and all other ecosystems needs to be controlled and managed so as to increase the species diversity and productivity of these ecosystems and prevent the intrusion of exotic species which is the worst consequence of grazing. Overall grasses are casually treated and sometimes altogether excluded from research as the maximum focus is being given to medicinal plants in the herbaceous category. However, grasses form an important component of the terrestrial ecosystems and should be studied thoroughly so that we are able to find out such species which are efficient in carbon sequestration as well as better forages for animals. Extensive study needs to be carried on the carbon dynamics of various ecosystems involving latest technologies like remote sensing and landscape modelling which are time saving, efficient and prevent the destruction caused to vegetation by the traditional harvest methods. The highest value of biomass for all the three seasons was recorded at Seed sown site (Badipora) followed by Protected site (Kanidajan) and the least at Grazed site (Yousmarag), as a result of extensive grazing the growth of the plant species was limited at Grazed site, which leads to the lesser accumulation of biomass.Pasture lands should be developed and rehabilitated or managed according.

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