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BIOMASS AND PRODUCTION IN HERBACEOUS LAYER OF SUB-TROPICAL FOREST AT DEHRADUN, UTTARAKHAND, INDIA

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ABSTRACT

The present study is an attempt to study biomass and production of herbaceous layer in a sub-tropical forest dominated by Sal tree at Dehradun. The aboveground biomass collected at monthly interval recorded two peaks (September, April) with 126.9 gm^{-2} and 60.8 gm^{-2} in study site I. ANP ranged between 66.9 $gm^{-2}yr^{-1}$ to 73.6 gm^{-2} $^{2}yr^{-1}$ whereas TNP recorded for the study was in the range of 1.1 tha^{-1} to 1.2 tha^{-1}.

Keywords: Subtropical Forest, Biomass, Production, Herbaceous layer.

INTRODUCTION

The forest floor vegetation serves to ameliorate soil temperature, moisture, reduce soil erosion, provide habitat for organisms and play an important role in forest nutrient cycle. However, the ground vegetation of a forest contributes only a small portion of total biomass of the forest ecosystem but it is certainly more efficient converter of solar energy when compared to woody vegetation (Ovington, 1959; Whittaker, 1966).

Biomass of forest stratum provides data of the actual quantities of the plant material available at a given time. It keeps on changing from one compartment of primary producer to the other by the process of production, mortality and disappearance. Zavitkovsky (1976) has studied ground vegetation biomass and production in various forest ecosystems. Singh and Singh (1984) and Rana *et al.* (1988) have analysed herbaceous biomass structure of Siwalik Chirpine-mixed broad leaf forest. The present study is an attempt to records herbaceous layer biomass and production in an subtropical forest ecosystem of district Dehradun.

STUDY SITE

The present study conducted in a subtropical forest is located in Mohand range of Siwalik Forest Division. It is 24 kms from Dehradun on right side of Dehradun-Saharanpur Road. It is a mixed forest but Sal (*Shorea robusta*) is the dominant tree. The associate tree species include *Terminalia tomentosa, Mallotus phillipinensis, Anogeissus latifolia*. The shrub layer is dominated by *Woodfordia fruticosa, Colebrookia oppositifolia, Murraya koenigii* and the dominant herbs include *Eulaliopsis binata, Apluda mutica, Saccharum spontaneum, Heteropogon contortus, Cymbopogon martinii* and *Desmodium* spp. The forest has settlement of *gujjars*, therefore grazing is frequent. Study site I is located on north face of the Siwalik mountain whereas study site II is located on the south slope of mountain. The area is open and grazing by cattle is frequent.

METHODOLOGY

Aboveground biomass of the forest herb layer is estimated by harvest method (Milner and Huges, 1968). Plant biomass was collected monthly interval on a fixed date from both the sites. On each sampling date six sampling plots of 1 x 1 m^2 were harvested from each site. The care was taken that sampled plot may not be sampled again in the following months.

Clipping was done by hand with the help of sharp scissors. In order to obtain the valid estimate of herbage, the vegetation was harvested close to ground level (Green, 1959). The cut vegetation from each harvest plot was picked in the polythene bags along with the litter. For the estimate of belowground biomass monoliths of 15 x 15 x 300 cm^3 were taken out from each sampled plot. The below ground biomass was removed from soil core (monolith) by washing thoroughly with running water. The aboveground and belowground biomass was oven dried at 80°C for 48 hours and weighed.

Total Net Production (TNP) was calculated by Positive Increase Sum Method (Singh and Yadav, 1974).

RESULT AND DISCUSSION

There was considerable variation in the aboveground plant biomass (Fig. 2). It increased from May (51.4 gm^{-2}) to a peak value in September (126.9 gm^{-2}). From October onwards a decline the aboveground biomass was recorded till January and again an increase in February (56.2 gm^{-2}) leading to a second peak (60.8 gm^{-2}) in April was reported in study site I. Similar pattern of two peaks in 12 months was recorded for the study site II.

The belowground biomass is always less than the aboveground biomass in both the study sites. However, the variation in peaks were recorded

Table 1 : Aboveground Net Production (gm^{-2}) (ANP), Belowground Net Production (gm^{-2}) (BNP) and Total Net Production (TNP) on monthly basis in Site I and II.

Month	Site I			Site II		
	ANP	BNP	TNP	ANP	BNP	TNP
Aug. '18	-	-	-	-	-	-
September	+30.5	+ 1.7	+ 32.2	+ 41.2	+ 2.0	+ 43.2
October	– 33.6	+ 5.5	+ 5.5	– 31.7	+ 2.4	+ 2.4
November	– 19.1	– 4.5	-	– 15.3	– 8.4	–
December	– 14.1	– 1.1	-	– 10.0	+ 14.5	+ 14.5
January '19	– 11.5	+ 12.4	+ 12.4	– 6.1	– 17.6	-
February	+ 7.6	+ 19.0	+26.6	– 4.1	+ 11.4	+ 11.4
March	+ 3.1	– 0.6	+ 3.1	+ 4.9	+ 5.8	+ 10.7
April	+ 1.5	– 21.5	+ 1.5	+ 5.4	– 16.2	+ 5.4
May	– 9.4	– 14.5	-	– 16.4	– 5.8	-
June	+ 5.8	– 5.3	+ 5.8	+ 1.6	– 2.2	+ 1.6
July	+ 18.4	+ 2.1	+ 20.5	+ 20.5	+ 9.6	+ 30.1
TNP **($gm^{-2}\,yr^{-1}$)**	66.9	40.7	107.6	73.6	45.7	119.3

Table 2 : Biomass and Production of Herb Layer in Various Forest Ecosystem in India

		Biomass (tha^{-1})	TNP (tha^{-1} yr^{-1})
Central Himalayan Sal Forest		1.8	2.1
Sal Old Growth Forest		38.36	1.86
Chir-Pine Forest		17.86	1.71
Siwalik Chirpine – Mixed Broad leaf Forest		1.72	2.0
Sub-Tropical Forest	Site-I	–	1.1
	Site-II	–	1.2

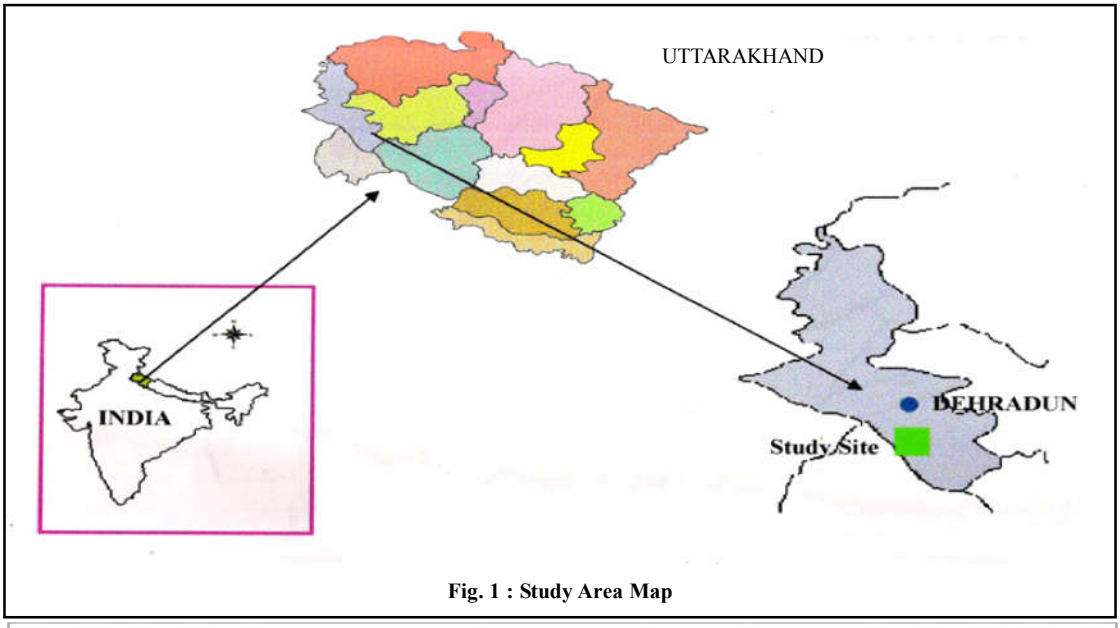

Fig. 1 : Study Area Map

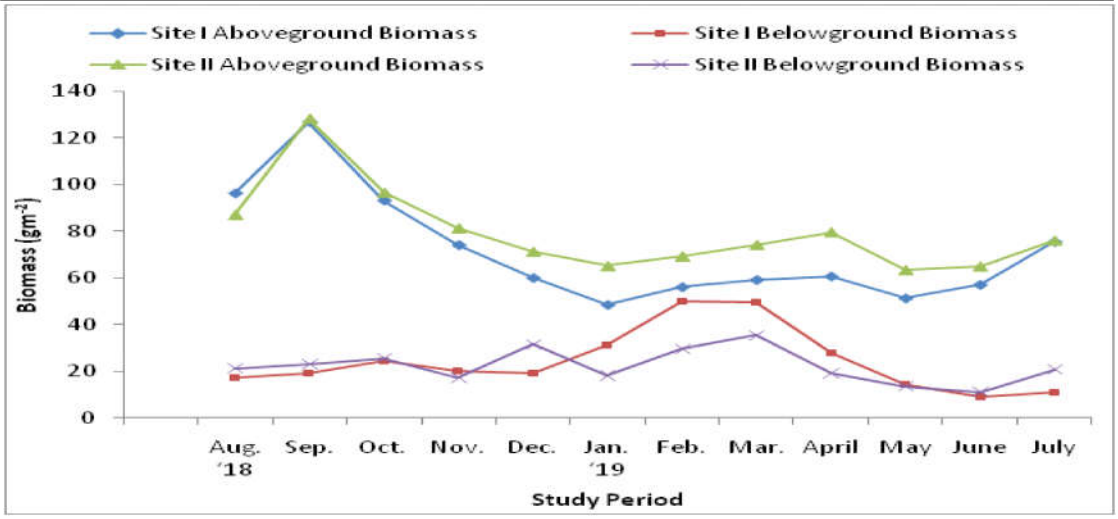

Fig. 2 : Monthly Variation in Aboveground Biomass (AGB) and Belowground Biomass (BGB) in Study Site I and II.

with two peaks (October and February to March) in site I and three peaks (October, December and March). Maximum belowground biomass (50.2 gm^{-2} and 31.7 gm^{-2}) was recorded for site I and II in February and December respectively.

The aboveground net production was 66.9 $gm^{-2}yr^{-1}$ and 73.6 $gm^{-2}yr^{-1}$ for the study site I and II respectively. The Net Belowground Production was estimated to be 40.7 $gm^{-2}yr^{-1}$ and 45.7 $gm^{-2}yr^{-1}$ respectively for the study site I and II. The Total Net Production of 1.1 tha^{-1} and 1.2 tha^{-1} in the study site I and II is low when compared to other forest herb biomass (Table 2). Rana *et al.* (1988) has reported 2.0 tha^{-1} yr^{-1} as TNP of a Central Himalayan Sal forest, whereas Singh and Singh (1984b) have reported 1.86 tha^{-1} yr^{-1} for a sal old growth. The low production is probably due to high grazing pressure by gujjar cattle and variation is climatic condition of forest ecosystems.

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