

## LITTER PRODUCTION IN A DRY DECIDUOUS FOREST IN THE FOOT HILL ZONE OF GARHWAL

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### ABSTRACT

This study deals with the litter production in a subtropical deciduous forest of foot-hill zone of outer Garhwal Himalaya. A little work has been done on litter production of these forest. Out of sixteen species recorded five were evergreen. *Holoptelea integrifolia* had highest annual leaf fall (8555.0 kg ha<sup>-1</sup>) and lowest in *Erythrina* and *Acacia nilotica* with temperature.

**Key words:** *Garhwal Himalaya, deciduous forest, litter production, leaf fall*

### INTRODUCTION

Fall-off of plant parts i.e. leaves, twigs, flowers, fruits, bark and branches are known as litterfall. The process of litterfall is very important for the forest ecosystem because it regulates the nutrient cycle of the particular area. All parts of the plant contain different quantities of elements. These part on decomposition produce organic material to the forest ground. This organic matter reduce the bulk density, increase water holding capacity and cation exchange capacity and serve as nutrient reserve for plants grown there (Hoyle, 1973) Litterfall plays vital role in transfer of energy from autotrophs to heterotrophs which in habitats in soil.

Forest floor surface is a fundamental component of the forest ecosystem in various references i.e. it provide nutrient pool involving inputs. Outputs and turnover of chemical elements. Bray and Gorham (1964) stated that the study of quantitative aspects of litter present on the forest floor is important part of forest ecology, since it deals with a major pathway for both energy and nutrient transfer in the ecosystem. It acts as pool of organic matter and nutrient regulating functional aspect of the ecosystem.

The accumulated litter on the forest floor reduces soil erosion and runoff. Because of the dense cover over the forest ground it increase percolation rate and nutrient concentration (Singh *et al.*, 1984) Leaf fall on the ground also helps seeds to grow by protecting them from severe cold and other animal enemies and providing a thick cover with moisture, temperature, nutrients and aeration. The breakdown of ground litter completes the nutrient cycle by its decomposition. Litter

production is a functional aspect forest ecosystem. Since this aspect is rather less analysed in the for the foothills forests, so the present study is an effort to evaluate the natural process.

## MATERIALS AND METHODS

The present work has been carried out in the Ganga valley near Rishikesh. The study area is the foot hill dry deciduous forest in the sub-montane zone of the Garhwal Himalaya lying between 400-600 m. above sea level. Meteorological data for the study area have given in Table 1. Total rainfall was 1667.9 mm with a monthly average of 138.9 mm. Average minimum and maximum temperature were 28.72°C and 15.86°C respectively. Average relative humidity ranged from 58 to 70.5%. Soil analysis indicated highest nitrogen concentration in 10-15 cm depth (0.29 ppm). Organic carbon was maximum (1.82%) at the depth 0-5cm.

To collect the litter, 12 traps were laid for each species on the forest floor. Each trap covered an area of one meter square following the method of Bray and Gorham (1964). At every 30 days interval the traps were harvested for litter, which was taken to laboratory. The litter was separated into different parts washed, oven dried and weighed. Care was taken in washing because the fragile parts are delicate enough to be broken and run off in water.

## RESULTS AND DISCUSSION

Among all 16 species studied, five were evergreen, because there is no clear-cut demarcation of shed down of old leaves and emergence of new leaves *Syzygium cumini* (Jamun) showed highest annual litterfall (8735.0 kg ha<sup>-1</sup>) while for other evergreen species it ranged from 5210.0 (*Ficus bengalensis*) to 5820.0 kg ha<sup>-1</sup> (*Aegle marmelos*). In *S. cumini* highest litterfall was recorded in June and August, and lowest in July and December (Table 2)

Maximum contribution to annual litterfall on the forest floor among deciduous trees was made by *Holoptelea intergifolia* (8555.0 kg ha<sup>-1</sup>), Highest leaf fall was recorded in March and April *Schleichera oleosa*, which had second highest value (7175.0 kg ha<sup>-1</sup>), produced maximum litterfall in the month of June and July, the hottest month of the year. The contribution to litterfall by other species ranged from 3615.0 (*Erythrina suberosa*) to 6065.0 kg ha<sup>-1</sup> (*Adina cardifolia*).

The leaf fall being the major part of litterfall is the process by which the plants save themselves from the unfavourable and adverse climatic conditions or after maturation of plant parts. Other part may fall after maturation or accident. In dry forest, litter production is limited by water availability, while in wet conditions other factors are responsible (Bullock and Solis-Magallanes, 1990; Martinez-Yrizer, 1995) Shoot growth and leafing are governed either by Climate of the year of bud formation or by both, the Climate of previous year and that of the year of leafing (Mikola,

## REFERENCES

- Addicott, F.T. 1968. Environmental factors in the physiology of abscission *Plant physiology*, 43: 1474-1479.
- Bray, J.R. and E.Gorham 1964. Litter production in forest of the world *Adv. Eco./ Res.* 2 : 101-175.
- Bullock. S.H and J.A. Soils Magallanes 1990. Phenology of canopy trees of a tropical deciduous forest in Maxico. *Biotropica*. 22:22-35.
- Cintron, B.B. and A.E. Lugo 1990. Litterfall in a sub-tropical dry forest: Guanica Puerto Rico. *Acta Cientifica*, 4 : 37-49.
- Hladik, A. 1978 Phenology of leaf production in rain forest of Gabon-distribution and composition of food for folivores. In the *Ecology of Arboeral Flolivors* (Ed. Montgomery). Smithsonian Institution Press Washington pp 51-71.
- Hoyle, M.C. 1973. Nature and properties of some forest soils in White Mountains of New Hampshire. *USDA Forest Service Research paper* NE-260 pp 18.
- Lieberman, D 1982. Seasonality and phenology in a dry tropical forest in Ghana. *J. Ecol*, 70 : 791-806.
- Lugo, A.E., J.A. Gonzalez-Liboy, B Cintron and K. Dugger 1978. Structure. productivity and tranpiration of a sub-tropical dry forest in Puerto Rico *Biotropica*, 10: 278-291.
- Malaisse. F.,R. Freson, G.Gaffinet and M. Malaisse-Mousset 1975. Litterfall and litter breakdown in Miombo. In *Tropical Ecological System* (Des. Golley and Medina). Springer-Verlag, New York: 137-152.
- Martinez-Yrizer, A 1995. Biomass distribution and primary productivity of tropical dry forests. In *Seasonally Dry Tropical Forests* (Eds. Bullock, Mooney and Medina) Cambridge University Press : 326-345.
- Martinez-Yrizer, A and J.Sarukhan 1990. Litterfall patterns in a tropical deciduous forest in Mexico over a five year period. *J. Trop. Ecol* 6:433-444.
- Martinez-Yrizer, A.J Sarukhan. M. Mass C Pinto and P Centeno 1992 Litter production in tropical deciduous forest in Western Mexico *Am. J. Bot.* 79 (6) 184.
- Mikola, P 1962 Temperature and tree growth near the northern timberline. In *Tree Growth* (Ed. Kozlowski) Ronald press New york: 265-274.
- Pandey, P.K. and S.C. Sharma 1986. Seasonality and pattern in leaffall and litter accretion on the forest floor in plantations of demonstration area. Forest Research Institute and College Dehradun (India) *Ind. For.* 112: 328-341.

- Reich, P.B. and R.Borchert 1984. Water stresses and tree phenology in a tropical dry forest in lowland of Costa Rico. *J.Ecol.* 72: 61-74.
- Rowe, J.S. 1964 Environmental preconditioning with special reference to forestry. *Ecology.* 45: 393-403.
- Singh, K.P. 1968 Litter production and nutrient turnover in deciduous forests of Varanasi. In Proceedings of the Symposium of Recent Advances in Tropical. *Ecology.* (Eds. Misra and Gopal). International Society for Tropical Ecology, Varanasi. India 655-665.
- Singh, K.P. 1969 Studies in decomposition of leaf litter of important trees of tropical deciduous forests at Varanasi *Trop. Ecol.* 10: 292-311.
- Singh, R.P., H.P. Mathur and M.K. Gupta 1984. Litter production and release of nutrients in coniferous forests of Himachal Pradesh *Ind. For.* 110: 1014- 1022.
- Singh, S.P. Y.S. Rawat. B.S. Rana and GC Negi 1990 Effects of unusually large seed crop on litterfall and nitrogen re-translocation in Himalayan Oaks. *for Ecol. Manage.* 32: 79-86.
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