IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 14, Issue 8 Ser. IV (August 2020), PP 77-79
www.iosrjournals.org

Comparative Study on nutrient release from litter of Quercus incana and Shorea robusta

Dr. Shikha Saxena
Associate Professor, Chemistry Department
D.A.V. (P.G.) College, Dehradun

Abstract *–The main sources of litter are forests, grasslands and aquatic plants. The quantity and chemical nature of litter depends upon the type of vegetation of the forest. The inorganic constituents of litter are Calcium, Potassium, Magnesium, Iron, Manganese, Silicon, Copper, Aluminium, Phosphorous, Nitrogen etc. Difference in the concentration of these inorganic chemicals has been recorded according to the type of forest. In the present study the elemental mobality of the nutrients returned through litter of Quercus incana (oak) and Shorea robusta (Sal) during pre & post monsoon seasons. The analysis showed that the concentration of macro-nutrients available from leaf and twig was higher in post-monsoon season, and also nutrient release from litter ofShorea robusta (Sal) is more than litter of Qurcus incana (Oak).*
Keywords *: Vegetation, Nutrients, Litter, Concentration*

I. Introduction :

Litter decomposition is a complex process in which both physical and biological agencies participate either together or separately to reduce the litter to soil organic matter and mineral elements (Singh and Gupta 1977); Swift et.al. 1979; Charley and Richards 1983). The litter is broken down by the activity of decomposer community such as micro-organisms and invertebrate soil animals (Carlisle et. al. 1967; Gessel and Turner 1974; Ewel 1976 and Edward 1977). The predominant control of litter decomposition in different vegetation types has been attributed undoubtedly to the temperature and moisture limitation by a number of workers (Griffin 1972; Meeentemeyer 1978), Lambert et. al. 1980; Woods and Raison 1983). Climatic variables also play a vital role in controlling the decay rate (Lanuza et.al. 2018). Principal physico-chemical factors which affect the decomposition rate have been reviewed by Swift et. al. (1979). Wherein, they have discussed mainly the role of moisture, aeration, oxygen content, carbon-dioxide, pH and temperature which affect the micro-organisms and decay rates. Pandey and Singh (1981), while working in Oak-conifer forest of Himalaya found a linear relationship of decomposition rate with rainfall and temperature. In the same year, Gupta and Singh investigated decomposition of plant material in a tropical grassland and the impact of plant species. Whether variables and chemical composition Lousier and Parkinson (1976) observed that nitrogen, calcium and potassium constituted 89% of the total return and the sequential order by weight of these elements was Ca>N>Mg>P>Zn>Fe>Mn>Na>Cu, which was almost similar to the order given by Rodin and Basilevich (1967) for some Russian aspen forests. However, the rate of nutrient returned (especially Nitrogen) was higher in tropical than temperate forests. It was due to high rate of litter fall in tropical than temperate forests and higher concentration of nitrogen as reported for tropical forests by Nye (1961).

II. Material and Methods

A field study was conducted for two years in Mussoorie Himalaya. The area of study is located from 77^0 east longitude to 78^0 20′ east longitude and 30^0 north latitude to 30^0 30′ north latitude with the altitude ranging from 330 to 200 m from sea level about 60% of the total area is covered with forest and 14% represent cultivated area fields. The vegetation concerns to three main types (a) tropical (b) temperate (c) alpine. The number of locations selected for litter analysis is two namely : Bhattafall (S1) and Phakot (S2) lying in Mussoorie hills.

III. Results and Discussion

The sample of decomposing leaves and twigs collected from the study sites for the analysis of nutrients were oven dried at 80^0 C (suitable temperature) after standardisation of the technique and then it was powdered in a Thomas Wiley Mill. The powdered samples were weighed and ashed in a muffle furnace at 500^0 C and HCl extract was prepared for the estimation of nutrients.

Thereafter the chemical analysis of litter at an initial stage, as well as, at various stages of decomposition was done following standard methods (Piper 1944 and Allen 1974). Magnesium was determined in an Atomic absorption spectrophotometer (Pye unican 3200). Phosphorous was determined by phosphomolybdic colorimeter method as suggested by Misra (1968). To estimate the concentration of potassium

and calcium, the systronics flame photometer was used (Vogel, 1961). Total nitrogen was estimated by Kjeldahl's method (Loomis and Shull, 1937).
The data on litter analysis for various nutrients as total of leaves and twigs has been presented in the tables 1 and 2. At each sampling sites almost all the plantation showed an unimodel pattern of leaf fall.

Sampling Site (S1) – At this site, the dominant species was Q. incana (oak) Calcium and Nitrogen were the dominant nutrients in both the season. However in first year, the calcium concentration was higher than that of Nitrogen. The percentage of other available nutrients, Phosphorous and Magnesium, there was great variation in the percentage concentration of the two. Potassium content was observed to be more than that of the Phosphorus and Magnesium.
Sampling Site (S2) – There were two species of trees viz. Q. incana and Shorea robusta at this site but the dominant species was Shorea robusta at this site. In this site, the nitrogen was found dominant. The mobility of the nutrients was in the order of N>Ca>K>Mg>P.

Table 1 : Litter analysis for macronutrients concentration at the sampling sites during pre-monsoon season

S.No.	Dominant Species	Sampling Sites	Component	Macronutrients (%)				
				N	P	K	Ca	Mg
1	Quercus incana	S1 1st year	Leaf & Twig	0.16	0.03	0.03	0.18	0.01
		S1 2nd year	Leaf & Twig	0.15	0.02	0.03	0.17	0.01
2	Shorea robusta	S2 1st year	Leaf & Twig	0.80	0.02	0.20	0.59	0.13
		S2 2nd year	Leaf & Twig	0.92	0.03	0.4	0.77	0.20

Table 2 : Litter analysis for macro nutrients concentration at the sampling sites during Post-monsoon season

S.No.	Dominant Species	Sampling Sites	Component	Macronutrients (%)				
				N	P	K	Ca	Mg
1	Quercus incana	S1 1st year	Leaf & Twig	0.19	0.06	0.04	0.20	0.02
		S1 2nd year	Leaf & Twig	0.20	0.07	0.03	0.22	0.03
2	Shorea robusta	S2 1st year	Leaf & Twig	1.48	0.11	0.58	1.27	0.22
		S2 2nd year	Leaf & Twig	1.53	0.12	0.55	1.25	0.25

IV. Conclusion

The purpose of this comparative study was to find the nutrients release from litter of Quercus incana (Oak) and Shorea robusta (Sal) in different seasons. We have calculated different macro-nutrients release from the litter of two mentioned trees during pre and post monsoon seasons. This study on litter from Shorea robusta (Sal) indicated that there was more released of nutrients that what is was from Quercus incana (Oak). During post-monsoon season the value of nitrogen, potassium, phosphorous, calcium and magnesium released is higher than the values of these nutrients released during pre-monsoon season.

Reference

[1]. Allen, S.E. (1974), Chemical analysis of ecological material also. Ed. Oxford Blackwell Scientific Publ. p. 565.
[2]. Carlisle, A., Brown, A. H. F. and White, E. J. (1967). The nutrient content of tree stem-flow and ground flora litter and leachates in Sessile Oak Woodland, J. Ecol., 54 : 65-85.
[3]. Charley, J. R. and Richards, B.N. (1983). Nutrient allocation in plant communities, minerals cycling in terrestrial ecosystem. In : O.L. Lang, P. S. Nobel, C. B. Osmand and M. Ziegler (Editors), Physiological Plant Ecology, IV, Springer, Berlin, pp. 5-45.
[4]. Edward, P. J. (1977). Studies of mineral cycling in montane rain forest in New Guinea II. The production and disappearance of litter. J. Ecol., 65 : 971-992.
[5]. Ewel, J. J. (1976). Litterfall and leaf decomposition in a tropical forest succession in eastern Guatemala. J. Ecol., 64 : 293-308.
[6]. Gessel, S.P and Turner, J. (1974). Litter production by red alder in Western Washington. For. Sci., 21 : 325-330.
[7]. Griffin, D. M. (1972). Ecology of soil Fungi. Chapman and Hall. London : 193p.
[8]. Gupta, R. K. (1966). Studies on the succession of the Oak conifer forests of the Garhwal Himalays. Trop. Ecol., 7 : 67-83.
[9]. Lambert, D. H., Arnason, J. T. and Gale, J. L. (1980). Leaf litter and changing nutrient in a seasonally dry tropical hardwood forests, Belize, C. A. Plant and Soil. 55 : 429-443.
[10]. Lanuza, O., Casanoves, F. Zahawi, R.A., Celentano, D., Delgado, D., Holl, K. D. 2018. Litterfall and nutrients dynamics shift in tropical forest restoration sites after a decade of recovery. Biotropics 50 : 491-498.
[11]. Loomis, W.E. and Shull, A.C. (1937). Methods in plant physiology. McGraw Hill Book Co. Inc., New York.
[12]. Lousier, J. D. and Parkinson, D. (1976). Litter decomposition in a cool temperate deciduous forest. Can. J. Bot., 54 : 419-436.

[13]. Meentemeyer, V. (1978). Macroclimate and lignin control of litter decomposition rates. Ecology, 59, 465-472.
[14]. Mishra, R. (1968). Ecology Work Book. Oxford and IBH Publishing Company, Calcutta, Bombay, New Delhi.
[15]. Nye, P. H. (1961). Organic matter and nutrient cycles under moist tropical forest. Pl. soil. 12(4) : 333-346.
[16]. Olson, J.S. (1963). Energy storage and the balance of producers and decomposers in ecological systems. Ecology, 44 : 322-331.
[17]. Pandey, U. and Singh, J. S. (1981). Leaf litter decomposition in an Oak conifer forest in Himalaya. The effect of the climatic and chemical composition. Forestry 55(1) : 47-59.
[18]. Piper, C. S. (1944) : Soil and Plant Analysis. Inter science publ., New York.
[19]. Singh, J.S. and Gupta, S. R. (1977). Plant decomposition and soil respiration in terrestrial ecosystem. Botanical review, 43 : 449-528.
[20]. Swift, M. J., Heal, O.W. and Anderson, J.M. (1979). Decomposition in terrestrial ecosystem univ. of California Press, Berkely, California, U.S.A.
[21]. Vogel, A. L. (1961). Quantitative inorganic analysis including elementary instruments analysis. Longmans, Green & Co. Ltd., London.
[22]. Woods, P.V. and Raison, R. J. (1983). Decomposition of litter in sub-alpine forests of Eucalyptues delegatensis, E. pouciflora and E. dives. Australian J. Ecology, 8(3) : 287-299.