

Abstract

Chemistry, time course of decomposition, nutrient release pattern and nutrient resorption efficiency of leaf litter of *Gliricidia sepium*, *Acacia auriculiformis*, *Acacia mangium*, *Macaranga peltata*, *Alstonia macrophylla*, *Artocarpus integrifolia*, *Artocarpus altilis*, *Terminalia catappa*, and *Mangifera indica* were investigated using the litter bag technique.

Considerable inter-specific variations in the above parameters were observed in the leaf litters. As regards percent N, P, K, Ca, and Mg, the values observed varied from 0.39 to 1.92, 0.025 to 0.17, 0.16 to 0.95, 1.76 to 2.57 and 0.22 to 0.51, respectively. The highest concentrations of N, P, K, Ca and Mg were observed in *G. sepium*, *A. altilis*, *A. altilis*, *A. integrifolia* and *A. macrophylla*, respectively. *A. macrophylla*, *M. indica* and *A. mangium* had the highest concentrations of carbon (42.39%), lignin (22.99%) and cellulose (32.77%), respectively. A salient feature in the leaf litter of *M. indica* was that it had the lowest concentrations of N (0.39%) and cellulose (14.59%) and the highest concentration of lignin (22.99%), with a lignin/N ratio of 58.21 and C/N ratio of 92.71.

G. sepium showed the greatest biomass loss, losing as much as 60% of its dry weight, 30 days after placement. In contrast, *M. indica* had the lowest rate of decomposition. The decomposition constant of the species varied from 1.66 (*M. indica*) to 8.46 yr⁻¹ (*G. sepium*). The half-life of litter types ranged from 29 (*G. sepium*) to 152 days (*M. indica*). Decomposition rates were positively correlated with the per cent initial N ($r = 0.85$, $p < 0.01$) and negatively correlated with the C/N ratio ($r = 0.58$, $p \leq 0.01$).

Considerable inter-specific variations in nutrient release pattern were observed among litter types, except for K. *G. sepium* and *A. auriculiformis* lost over 50% of their initial N content by 30 days, whereas *A. altilis*, *T. catappa* and *M. indica* immobilized N from the soil. The per cent N immobilized ranged from 4 to 20 while *M. indica* recorded the highest value. Except *A. altilis*, other species released P during the first month of decomposition. *A. altilis* immobilized P, which amounted to 28%. K was a highly leachable element in the soil, and all the species, except *M. indica*, lost more than 70-80 % of their initial K content in 30 days. Nutrient release pattern was correlated to mass loss with a few exceptions for K and P. Nitrogen loss was positively correlated with the initial N content ($r=0.44$, $p \leq 0.05$) and was negatively correlated with the C/ N ratio ($r=0.58$, $p \leq 0.05$). Potassium release pattern showed a positive correlation with the C/ K ratio ($r=0.51$, $p \leq 0.05$).

Significant inter-specific differences in nitrogen resorption efficiency (NRE) were observed ($p \leq 0.05$) with *T. catappa* and *M. indica* showing higher NRE (54.58 and 48.78%, respectively) while *G. sepium* showing the lowest (28.94%). The NRE was negatively correlated with the initial N concentration of leaves in mature stage of all species ($r=0.58$, $p \leq 0.05$). These findings prove useful in identifying suitable combinations of agroforestry tree species for sustainable soil fertility management.