

EFFECTS OF LITTER DIVERSITY ON THE RATE OF DECOMPOSITION IN AN AGROFORESTRY SYSTEM IN A SEMI-ARID ZONE IN JUJA, KENYA

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Abstract

Plant litter decomposition is an important ecosystem function that aids nutrient cycling in agroforestry systems. However, there is little information on how diversity of agroforestry tree species affects the rate of decomposition of the resultant litter. This study was conducted in an agroforestry experimental farm in Jomo Kenyatta University of Agriculture and Technology, Juja, Kenya. The experiment constitutes seven agroforestry tree species from which eleven compositions were made. Leaf litter of each agroforestry tree species was collected from the site, dried at 65°C and crushed into (1-3 cm) sizes. For each of the composition, 20 litter bags (20*13cm) were prepared using 5 g of litter and each species represented in equally mass in the mix. Initial nutrients content was determined in four replicates samples of each composition. The remaining sixteen samples of each composition were installed in the plots. Four replicates of each composition were evacuated on the 15th, 30th, 56th and 90th day and oven dried at 65°C until constant weight to determine mass loss in the litter. Nitrogen, phosphorus, potassium and carbon content were determined from the composite of the evacuated bags for each composition to determine nutrients released. The effect of diversity on mass loss and nutrient released was determined by comparing the value in mixtures with the average of the constituent monocultures. Additive effect was observed in mass loss while additive effect was observed on nitrogen, phosphorus and potassium release but non-additive effect on carbon released. These findings show that litter diversity of agroforestry trees increases the rate of decomposition and nutrients released in low quality trees. Farmers should therefore use different agroforestry trees to benefit from the synergy of different ecosystem functions that tree species could render such as enhancing decomposition rate and nutrient release in low quality tree species.

Key words: Agroforestry, decomposition, nutrients, additive effect, non-additive effect