Influence of riparian land use and streambed topography on decomposition rates of Syzygium guineense and Eucalyptus saligna leaf litter in a tropical montane stream, the Kamweti River, Kenya

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Abstract

Leaf litter decomposition is a key ecosystem process that serves as a source of energy in stream ecosystems. However, land use change from forest to agricultural land has been reported to negatively affect stream ecosystem functions. Streams exhibit heterogeneity in terms of physical, chemical, biological characteristics and human-related influences. This may in turn affect stream ecosystem functions (e.g., leaf litter decomposition). However, information on the effects of land use and streambed topography on the functioning of many tropical stream ecosystems is still limited. This study assessed the influence of land use (i.e., forest vs agriculture) and streambed topography (i.e., riffles vs pools) on the decomposition rates of *Syzygium guineense* and *Eucalyptus saligna* leaf litter in the Kamweti River, Kenya. A total of 400 coarse-mesh litter bags were used to enclose 5 ($\pm$ 0.05) g of each plant species leaf litter. The leaf litter was incubated in the selected study sites and litter bags were retrieved after 1, 3, 8, 14, 21, 28, 35, 42, 49 and 56 days of incubation. Physico-chemical parameters were also measured in all the sites. Decomposition rates were estimated using the negative exponential decay model. Linear Mixed-effect Models were used to evaluate the effect of land use, streambed topography and plant species on leaf litter decomposition rates. Physico-chemical water parameters differed significantly between the two land uses (all $p < 0.05$), except for pH and total nitrogen concentration ($p > 0.05$). Forested sites (*Syzygium* = 0.03 $\pm$ 0.004, *Eucalyptus* = 0.04 $\pm$ 0.004) had relatively higher mean leaf litter decomposition rates than agricultural sites (*Syzygium* = 0.02 $\pm$ 0.004, *Eucalyptus* = 0.03 $\pm$ 0.006), although not significantly different. On the other hand, riffle habitats had significantly higher decomposition rates ($p<0.05$) than pool habitats across the two land uses. Streambed topography had a significant effect on decomposition rates of leaf litter, as opposed to land use. Therefore, local scale factors are more important in the decomposition process than catchment scale factors in the Kamweti River. Stream conservation and management efforts should be directed to the local scale factors as opposed to only riparian and catchment factors.

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