

Abstract

Microbial and enzyme activities can be used to identify and assess the impacts of changes in land use management on soil quality. However, only few studies have investigated the effects of land use and nutrient additions on enzyme activities and microbial processes in tropical African soils. Glucose and nutrients (N and P) were added to soils (0–20 cm) from natural and agricultural ecosystems: (1) savannah, (2) maize fields, (3) lower montane forest, (4) coffee plantation, (5) grasslands (6) *Chagga* homegardens common at Mt. Kilimanjaro region and East Africa. Microbial biomass and activities of β -glucosidase, cellobiohydrolase, chitinase and phosphatase were monitored over 60 days incubation period. Microbial biomass content and enzyme activities were generally higher in soils under natural vegetation compared to corresponding agricultural soils. Decline in microbial biomass C content over time was higher in natural ecosystems compared to agricultural soils. However, the microbial biomass C content in *Chagga* homegarden soils was relatively stable. Land use was negatively correlated to β -glucosidase, cellobiohydrolase and chitinase activity, but positively correlated to phosphatase activity. β -glucosidase and cellobiohydrolase, involved in the C-cycle, were the most sensitive to land use change. Chitinase activity was 2–6 times higher in soils under natural vegetation compared to corresponding arable soils. Phosphatase displayed very high activities in all land use types. This is attributed to the high P retention capacity common for andic soils similar to those occurring at Mt. Kilimanjaro region. Increased P availability stimulated enzyme activities in lower montane forest and *Chagga* homegarden soils. Overall, microbial biomass and enzyme activities showed a strong decrease with increased land use intensity and should therefore be taken into consideration in monitoring and assessing the impact of land use change at Mt. Kilimanjaro region.