Abstract

Indigenous grasses have been effectively used to rehabilitate degraded African drylands. Despite their success, studies examining their effects on soil bioindicators such as microbial biomass carbon (C) and enzyme activities are scarce. This study elucidates the effects of drought stress and phenological stages of a typical indigenous African grass, *Enteropogon macrostachyus*, on microbial biomass and enzyme activities (*β*-glucosidase, cellobiohydrolase, and chitinase) in the rhizosphere soil. *Enteropogon macrostachyus* was grown under controlled conditions. Drought stress (partial watering) was simulated during the last 10 d of plant growth, and data were compared with those from optimum moisture conditions. The rhizosphere soil was sampled after 40 d (seedling stage), 70 d (elongation stage), and 80 d (simulated drought stress). A high root:shoot ratio at seedling stage compared with elongation and reproduction stages demonstrated that *E. macrostachyus* invested more on root biomass in early development, to maximise the uptake of nutrients and water. Microbial biomass and enzyme activities increased with root biomass during plant growth. Ten-day drought at reproduction stage increased the microbial biomass and enzyme activities, accompanying a decrease in binding affinity and catalytic efficiency. In conclusion, drought stress controls soil organic matter decomposition and nutrient mobilization, as well as the competition between plant and microorganisms for nutrient uptake.