

Grazing history impacts mycorrhizal communities and plant tolerance to simulated herbivore damage

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Abstract. Arbuscular mycorrhizal fungi (AMF) maintain symbioses with nearly two thirds of all plant species. These fungi colonize plant roots and perform many integral functions in support of plant health. In this study, the effects of ungulate herbivores, AMF, and their plant hosts were explored by examining how the history of grazing affects the diversity of AMF present in soils and how the AMF communities, in turn, affect the ability of plants to tolerate simulated herbivory. Soils were acquired from experimental plots in Kenya from which herbivores were excluded or allowed for the past 15 years. AMF spores were isolated from the soils and categorized morphologically to compare species diversity among treatments. Experimental pots were established containing mycotrophic nurse plants and inoculum from three treatments including total ungulate exclusion, cattle access only, and full ungulate access, with a subset of pots being established with sterilized inoculum as controls supplemented with a microbial filtrate to replace a portion of the non-AMF microbial community. A subset of plants per inoculum type were assigned to be clipped to simulate herbivory, while the remaining plants were left as unmodified controls. Above ground growth was measured weekly throughout the experiment and above and below ground biomass was measured upon completion. Unexpectedly, plants grown in sterilized medium supplemented with microbial filtrates grew faster before and after clipping and had higher above and below ground biomass than their mycorrhizal counterparts, with the difference being statistically significant in two of the treatments. These results may be due in part to host-specific interactions between AMF communities and plant hosts, the observed presence of non-AMF endophytic fungi within the roots of plants in the mycorrhizal treatments, and possible differences in the microbial communities present amongst treatments. These results highlight the importance of community dynamics on plant physiological responses to stress.