

Do earthworms affect the utilization of nutrients and the mycorrhizal colonisation of grassland plants?

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Earthworms and arbuscular mycorrhizal fungi (AMF) are key-organisms in grassland ecosystems and are known to individually affect the diversity and functioning of these systems. However, there still exists little knowledge on the ecological interactions of earthworms, AMF and plants. The objectives of this study were to investigate whether (i) plant species can utilize nutrients and/or AMF present in subsurface earthworm casts, (ii) the activity of vertical burrowing (anecic) and soil dwelling (endogeic) earthworms differentially affect the distribution of nutrients and/or AMF, and (iii) earthworm activity affects the productivity and structure of grassland ecosystems.

We tested this in a full-factorial mesocosm experiment (mesocosm diameter 45 cm, volume 40 l) in a greenhouse with a patch of earthworm cast material inserted in 25 cm depth in each mesocosm. Mesocosms were planted with 11 low-fertile grassland species representing grasses, non-leguminous herbs and leguminous herbs. In order to be able to trace the functional links between ecosystem components, we labelled casts with stable isotope tracers (¹³C, ¹⁵N) and inoculated them with a mixture of four widely distributed AMF species (*Glomus intraradices*, *G. mosseae*, *G. geosporum*, *G. claroideum*). Earthworm species used were the anecic *Lumbricus terrestris* and the endogeic *Aporrectodea caliginosa*. Nutrient uptake, root colonisation by AMF and earthworm activity was monitored every third week. After six months, the mesocosms were destructively harvested and plant biomass, root AMF colonization and isotopic signals in plant tissue measured. Possible species-specific colonisation of plant roots by *Glomus* species was determined using polymerase chain reaction (PCR).

Preliminary results indicate that earthworm activity specifically altered the nutrient utilisation and AMF colonisation of plant species. The impact of earthworm activity together with AMF symbiosis on the productivity and structure of grassland ecosystems is discussed.

Keywords: Arbuscular mycorrhiza fungi (AMF), earthworms, greenhouse experiment, mesocosms, plant-animal-fungi interaction, stable isotope tracing, PCR