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Investigating the Effects of Future Climate Scenario on Arbuscular Mycorrhizal Fungal Spore Dynamics in a Belgian Pear Orchard Ecosystem

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Climate change poses a significant threat to global natural- and agroecosystems, affecting key soil microbial communities, such as arbuscular mycorrhizal fungi (AMF). These fungi form symbiotic relationships with most terrestrial plants, including economically important ones like fruit trees. AMF are significantly sensitive to various climatic parameters, which influence their species composition, diversity, and ecological functions. Additionally, climate change alters AMF temporal dynamics, affecting their growth, distribution, and interactions with host plants across seasons.

Despite these insights, a critical knowledge gap remains in understanding how multiple climatic parameters simultaneously affect the dynamics of AMF communities. This study aims to address this gap by investigating the response of AMF in pear orchards to the worst-case climate scenario (i.e., RCP8.5) projected for Belgium in 2040. We used a state-of-the-art Ecotron facility, to simulate both ambient (2018) and future (2040) climate conditions in a pear orchard. In total six trees have been grown in the Ecotron in each of the climatic conditions. We assessed diversity, composition, and temporal dynamics of AMF spores, revealing patterns of dormancy and activity, and providing insights into shifts of AMF community phenology induced by climate change. Our research elucidates climate-driven dynamics of AMF in agricultural systems, and provides insights into maintaining sustainable crop production and soil fertility under future climate conditions.