

Is aboveground pathogen load influenced by belowground pathogen presence, plant community diversity, or precipitation amount?

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Interactions between plants and their aboveground and belowground pathogens are often highly intertwined and difficult to tease apart. Belowground microbes, like arbuscular mycorrhizal fungi and ectomycorrhizal fungi, can form mutualistic relationships where both the fungi and plants benefit. However, a plant may have natural enemies both above- and belowground. We tested whether plant diversity (species richness, phylogenetic diversity), the presence or absence of soil biota, and water availability interactively affect plant susceptibility to damage by aboveground enemies such as foliar pathogens and herbivory. We examined experimental tallgrass prairie communities at Tyson Research Center composed of 17 Missouri native species. These communities experienced drought or well-watered conditions and were planted in sterile soil or soil inoculated with microbiota from a tallgrass prairie at Shaw Nature Reserve in 2014. The communities consist of either one or six species, and the six-species mixes are either closely or distantly phylogenetically related. During the growing season, we recorded the type and severity of damage present on aboveground parts of plants. Our study shows that soil microbes influence the degree of aboveground damage that plants experience, however results varied by species. We conclude that above- and belowground plant-pathogen interactions are diversified between species, and that drought affects some species more drastically than others. Due to global warming, some ecosystems, including tallgrass prairies, may experience more frequent or intense droughts in the future. By discovering the conditions under which certain species experience the lowest pathogen load, we can better replicate favorable conditions in restoration and conservation projects.