Coping With Pests: Variable Responses of Grassland Species to a Native Soil Pathogen

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Understanding the mechanisms that influence plant species diversity is critical to sustaining current levels of biodiversity. It is now recognized that soil microbial communities impact plant species interactions, but most studies have focused on mutualists such as mycorrhizae and rhizobium, while soil pathogens remain poorly understood. To address this bias, we tested the response of 17 plant species to the native, fungal pathogen *Macrophomina phaseolina*, the causative agent of charcoal rot disease. Species selection was based on anecdotal reports of genera susceptible to infection and common grassland plants in the area. Additionally, these species represented the three most common plant functional groups (graminoids, legumes, non-leguminous forbs) and all species were native to Kansas grasslands with the exception of *Lespedeza cuneata,* an invasive legume that outcompetes many native plants, and *Glycine max* (soybean), an agricultural crop that is a known host plant. Plants were grown under greenhouse conditions with each species exposed to either control soil or soil inoculated with *M. phaseolina.* Following a 3 month growth period, plant biomass was harvested and weighed. Additionally, for species of legumes, the total number and mean mass of nodules was quantified. The presence of *M. phaseolina* generally led to a reduction in total plant mass with the exception of *Asclepias syriaca* which appeared to tolerate the pathogen. Despite reduced performance, only *Amorpha canescens* experienced high levels of mortality (75%) suggesting that this species is highly susceptible to charcoal rot. Root nodule formation occurred in three of the seven legume species examined: *Lespedeza capitata*, *Lespedeza cuneata*, and *Lespedeza virginica.* Of these species, differences in the number and mean mass of nodules was only observed in *L. cuneata* and *L. virginica.* Specifically, although the mean mass of nodules produced by *L. cuneata* remained constant between treatments, the number produced decreased when exposed to *M. phaseolina*. In contrast, the presence of *M. phaseolina* resulted in decreased nodule mass in *L. virginica*, however this also resulted in an increase in the number of nodules produced. These results suggest that the presence of *M. phaseolina* may influence grassland plant diversity by promoting the establishment of unique species assemblages throughout the community. Although most species experienced a decrease in performance, the amount of *M. phaseolina* used was potentially higher than natural levels. Future research should therefore examine varying densities of *M. phaseolina* in the soil and test the effects of *M. phaseolina* on competitive interactions between species.