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Tall Fescue Plants in a Growth Chamber

Arrival Order Affects Coinfecting Plant Pathogens

Disease has historically been studied in a one host-one pathogen framework, which does not capture the common occurrence of multiple pathogen infections within single host individuals. In addition, for animals and for plants (studied here), the order in which distinct pathogens infect the same host can influence the overall outcome of the pathogens' interactions on plant health. It was hypothesized that two experimentally inoculated fungal pathogens would induce mutually inhibitory immune pathways in their plant host due to different feeding strategies. Such immune suppression could allow the second-arriving pathogen to experience less host immune resistance. To determine the effects of the pathogens' arrival order on disease severity, tall fescue (*Schedonorus arundinaceus*) leaves were inoculated with *Colletotrichum cereale* and *Rhizoctonia solani* either simultaneously or sequentially. Disease symptoms were measured daily and quantified in ImageJ, and the area under the disease progress curves were calculated for each treatment to gauge disease severity over time. When *R. solani* arrived after infection by *C. cereale*, disease symptoms were more severe than when *R. solani* was inoculated simultaneously with *C. cereale*. In contrast, disease symptoms resulting from *C. cereale* infection did not vary in intensity over time when comparing simultaneous and sequential infections. These results suggest that the order in which pathogens infect a host can determine disease outcomes. The effect of arrival order on disease has implications for potential shifts in the relative timing of pathogen epidemics due to changing climate conditions. These results also informed a parallel study with live tall fescue hosts manipulating sequential and simultaneous arrival times to better model pathogen dynamics in nature.