

Undersown plant species affect disease severity in barley through aboveground processes

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From theoretical and experimental studies in model systems it is well established that species rich ecosystems are better at providing ecosystem functions such as biomass production, pollinator abundance, pest suppression or carbon sequestration than species poor ecosystems. Modern agroecosystems are depleted of diversity, heavily dependent on external inputs and notoriously sensitive to pathogen outbreaks. In the TWINWIN field experiment we study the potential of different undersown plants to provide a multitude of ecosystem functions in agroecosystems. When barley was grown with a diverse set of undersown species it suffered less from pathogen infection (mostly net blotch disease) and had lower proportions of damaged seeds (mostly insect larvae) than when grown alone or with only few undersown species. Most undersown species contributed to reduced disease pressure, but single undersown species varied greatly in their impact on barley yield. A pot experiment showed that reduced pathogen infection with increasing undersown diversity was mostly mediated through aboveground processes, while below-ground processes were less important. Understanding how diversification in general and single undersown species in particular affect different ecosystem functions, is crucial to design sustainable agroecosystems in the future.