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Microbial antagonism as a potential solution for controlling selected root pathogens of crops

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Root pathogens of crops can cause large reduction in yield, however, there is a limited range of effective methods to control such pathogens. Soilborne pathogens that infect roots often need to survive in the rhizosphere, where there is high competition from other organisms. In such hot spots of microbial activity and growth, supported by root exudates, microbes have evolved antagonistic mechanisms that give them competitive advantages in winning the limited resources. Among these mechanisms is antibiosis, with production of some significant antifungal compounds including, antibiotics, volatile organic compounds, hydrogen cyanide and lytic enzymes. Some of these mechanisms may suppress disease through controlling the growth of root pathogens. In this project we isolated various fungi and bacteria that suppress the growth of cotton pathogens in vitro. The pathogen-suppressive microbes were isolated from cotton production soils that are under different management strategies, with and without the use of organic amendments.

The potential of pathogen-suppressing microbes for controlling the black root rot disease, caused by the soilborne pathogen Thielaviopsis basicola, was confirmed using soil assays. We identified isolates with potential use as inoculant for cotton production in Australia. Having isolated a diverse group of antagonistic microbes enhances the probability that some would survive well in the soil and provide an alternative approach to address the problem of root disease affecting agricultural crops.