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A novel method for rapidly isolating microbes that suppress soil-borne phytopathogens

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Seedling establishment faces a large number of challenges related to soil physical properties as well as to fungal root diseases. It is extremely difficult to eliminate fungal pathogens from soils where their populations are established due to the persistent nature of their spores and since fumigation of resident fungi is very ineffective in clay-containing soils. Therefore it is necessary to find ways to overcome disease in areas where the soils are infected with fungal phytopathogens. The phenomenon of disease suppressive soils, where the pathogen is present but no disease observed, suggests that microbial antagonism in the soil may lead to the suppression of the growth of fungal pathogens. There are also cases in the literature where soil microorganisms were isolated that suppress the growth of phytopathogens. Antibiosis is one of the most important mechanisms responsible for fungal antagonism, with some significant antifungal compounds involved including antibiotics, volatile organic compounds, hydrogen cyanide and lytic enzymes. Isolation of pathogen-suppressive microorganisms from the soil is time consuming and tedious. We established a simple method for direct isolation of soil microbes (bacteria and fungi) that suppress fungal phytopathogens as well as procedures for confirmation of disease suppression. We will discuss such methods, which were so far tested with the cotton fungal pathogens Thielaviopsis basicola, Verticillium dahliae and Fusarium oxysporum and Verticillium fungicola. We have isolated a diversity of T. basicola-suppressive fungi and bacteria from two vastly different soil types. Identification of the antagonistic isolates revealed that they are a diverse lot, some belong to groups known to be suppressive of a wide range of fungal pathogens, endorsing the power of this technique to rapidly and directly isolate soil-borne microbes antagonistic to a wide variety of fungal pathogens.