# USE OF NATURAL PRODUCTS FOR SUPPRESSION OF SOILBORNE DISEASES OF CUCUMBER

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Biological control agents are being developed for use in integrated pest management strategies directed at controlling soilborne diseases of vegetables and other crops. We have screened a number of bacterial and fungal isolates for suppression of damping-off caused by *Pythium ultimum* and *Rhizoctonia solani* and for suppression of populations of *Meloidogyne incognita* on cucumber. Isolates of the fungus *Trichoderma virens* showed promise for suppression of damping-off on cucumber. In addition, isolates from the bacterial species *Serratia marcescens* and from the *Burkholderia cepacia* complex showed promise for suppression of damping-off caused by *P. ultimum*.

A major impediment to the widespread use of biological control agents is inconsistent performance. Attempts were made to improve suppression of damping-off on cucumber caused by *P. ultimum* and *R. solani* by combining isolates of *T. virens* with promising bacterial isolates. In certain cases, consistency of disease suppression and magnitude of disease suppression were enhanced with combinations of these beneficial isolates relative to these isolates applied individually. However, isolates of *Serratia marcescens* and certain isolates from the *B. cepacia* complex suppressed populations of *T. virens* in cucumber rhizosphere. Clinical isolates of *Serratia marcescens* and certain isolates from the *Burkholderia cepacia* complex have been shown to be opportunistic human pathogens on immunocompromised individuals providing another impediment to the use of live bacteria from these genera in biological control strategies.

Cell extracts containing inhibitory compounds produced by *Serratia marcescens* were coated onto cucumber seeds. Suppression of damping-off of cucumber caused by *P. ultimum* with these cell extracts was statistically similar to that provided by live cells of *S. marcescens.* Biochemical characterization of these cell extracts identified prodigiosin and the surfactant serrawettin W1 in these extracts. Preliminary experiments indicate that prodigiosin is inhibitory to *P. ultimum*. Experiments are underway to determine disease suppression with cell extracts from non-prodigiosin-producing strains of *S. marcescens* and strains from the *B. cepacia* complex.

These experiments indicate that it is possible to suppress damping-off of cucumber with cell-free preparations from bacteria. Use of these cell-free extracts may enhance disease suppression when combined with biological control agents such as *T. virens* without competing with biological control agents, such as *T. virens*, for resources in the rhizosphere. Use of cell-free extracts from *S. marcescens* and strains from the *B. cepacia* complex also minimizes concerns regarding perceived health risks associated with these bacteria.

Future experiments will be directed at determining suppression of *P. ultimum* and *R. solani* with cell extracts from combinations of these bacterial strains. Experiments will also be performed to determine disease suppression with cell extracts from these bacterial isolates combined with live *T. virens* preparations and compatibility of these cell extracts with *T. virens*.