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Antifungal effects of compost tea microorganisms on tomato pathogens

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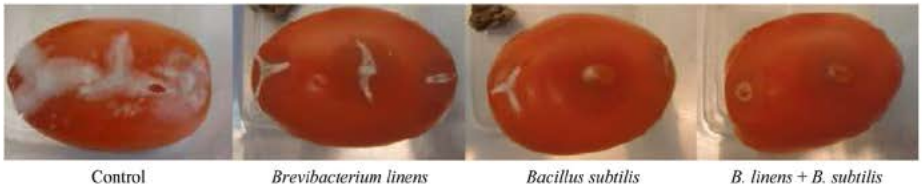
HIGHLIGHTS

- Bacteria from compost tea reduced mycelial growth of tomato pathogens.
- *Bacillus subtilis* and *Brevibacterium linens* inhibited disease on tomato fruit.
- Combined bacterial application revealed synergistic effects.
- *Bacillus subtilis* produced antifungals from the surfactin family of lipopeptides.

GRAPHICAL ABSTRACT

Effect of co-application of antagonistic bacteria on gray mold (*Botrytis cinerea*) of tomato fruit



Control | *Brevibacterium linens* | *Bacillus subtilis* | *B. linens* + *B. subtilis*

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ABSTRACT

Compost teas are fermented aqueous extracts of composted materials that are used for their ability to control plant pathogens. It had been previously reported that this inhibition by compost teas is at least partially attributed to the presence of live microorganisms. In this study, the inhibitory effects of bacteria from suppressive compost tea were examined against mycelial growth of *Alternaria solani* and *Botrytis cinerea* as well as disease development on tomato fruit. Isolation of antifungal extracts and identification of antifungal compounds from the most effective bacterial strains were also performed. Results showed that the bacteria had the ability to greatly inhibit the mycelial growth of *B. cinerea* and/or *A. solani* by up to 70%. The two most effective isolates, *Brevibacterium linens* (IC 10) and *Bacillus subtilis*, showed that co-application of bacterial antagonists (5×10^5 or 5×10^6 cells) with the pathogens on tomato fruit demonstrated inhibition of the development of *B. cinerea* lesions by up to 61%. A preventive application of the bacteria (5×10^5 or 5×10^6 cells) was more effective than co-application, allowing a significant reduction in lesions of *A. solani* and improving efficacy of low bacterial concentrations in reducing *B. cinerea* lesions. A combined *B. linens*/*B. subtilis* treatment was generally more inhibitory than either bacterium alone indicating possible synergistic effects. Antifungal compounds, including surfactins, were found in the bacterial extracts indicating that antibiosis is a main mechanism of action.