A novel plant "wire communication" after infection by foliar necrotrophic pathogens: first description of *Trichoderma* as an interplant communicator

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Abstract:

For several decades it has been studied and demonstrated how mycorrhizal fungi have the ability to colonize the roots of neighboring plants, connecting them through a fungal network. This group of hyphae is used as a "wire communication" between plants that allows the transmission of signals between plants about biotic (pathogens and pests) and even abiotic (a fire) stresses; widely known as "the internet of forests". Although this mechanism is widely known in mycorrhizal fungi, it has not been described in other groups of fungi, such as endophytic fungi. Within this group, *Trichoderma* is a genus of filamentous fungi widely studied and used as a biological control agent in agriculture, no capacity described so far as an inter-plant communicator. To study this possible biological phenomenon, we used the model plant *Arabidopsis thaliana*, the species *Trichoderma hamatum*, isolated from kale roots (*Brassica oleracea* var. *acephala*), and the pathogens *Sclerotinia sclerotiorum* and *Xanthomnas campestris* (necrotrophic fungus and hemibiotrophic bacterium, respectively). Through analysis of foliar infection by pathogens, root colonization by *Trichoderma* and systemic plant defense responses, we have been able to identify for the first time the ability of *Trichoderma* to act as an inter-plant communicator. This is due to a systemic foliar increase of jasmonic acid-mediated defenses, which cause an antagonistic increase of salicylic acid-mediated defenses in roots. In turn, root defenses control and respond to *Trichoderma* colonization levels, a mechanism used by the fungus to signal between neighboring plants. However, it is

important to note that this mechanism only works with necrotrophic pathogens, without developing in response to the hemibiotrophic pathogen.

Keywords: *Sclerotinia sclerotiorum*; *Xanthomonas campestris*; jasmonic acid; salicylic acid; inter-plant communication; fungal networks.

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