

The effects of volatile organic compounds emitted by *Bacillus* K165 on *Arabidopsis thaliana* innate immunity and growth

Réjane Carron

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Crop losses to pests have tremendous effects on the agriculture productivity. Moreover, evidence accumulates concerning the deleterious effects of pesticides on the environment. It is therefore decisive to find sustainable pest control alternatives in order to achieve worldwide food security. Over the last decades, an increasing interest has been taken in Volatile Organic Compounds (VOCs) emitted by bacterial strains isolated from the plant microbiome. VOCs are able to inhibit pathogen growth, restrain disease severity via induction of plant defense responses and modulate plant development. This master project demonstrates the promising capacity of VOCs emitted by *Bacillus* K165 to manipulate *Arabidopsis thaliana* innate immunity and growth. K165 VOCs slightly inhibit mycelium growth of *V. dahliae* and *B. cinerea* in a medium-dependent way, namely solely when K165 is growing on PDA, while no VOCs effect is depicted on the spore germination of both pathogens. *A. thaliana* exposition to K165 VOCs prior *B. cinerea* infection reduces the disease severity by 50%. A direct antimicrobial effects of K165 VOCs on the pathogen is excluded, therefore are K165 VOCs protective effects mediated via the plant immunity system. The diminution in infection symptoms is linked to an upregulation of *A. thaliana* defense-related genes. The salicylic acid pathway, induction of Systemic Acquired Resistance (SAR), might be important in the VOCs-mediated protection of *A. thaliana*. Additionally, VOCs emitted by K165 modulate the *in vitro* growth of *A. thaliana* seedlings in a medium-dependent manner. The seedlings exposed to K165 VOCs present a shortening of the primary root along with a decrease in the lateral root number yet elongated. The root system architecture modulation induced by K165 VOCs is partially retrieved via application of tropone, a pure volatile compound characterized from K165 volatilome. Furthermore, the characterization of K165 volatilome reveals a strong growth medium-dependent volatile production. The capacity of bacterial VOCs to trigger plant immune system leading to a decreased disease severity coupled with the growth modulatory effects on the plant root system architecture makes bacterial VOCs appealing biocontrol agents.

Prof. Laure Weisskopf