Characterization of metabolic responses in tomato induced by the soil-borne pathogen *Verticillium dahliae*

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Abstract

Soil-borne pathogens severely influence plant growth and development often resulting in significant yield and quality losses. *Verticillium* wilt is mainly caused by two soil-borne fungi, *V. dahliae* and *V. albo-atrum*, which have a wide host range of approximately 300 woody and herbaceous plant species. Economically important crops such as *Solanaceae* (tomato, potato, eggplant, pepper), *Fragaria* (strawberry) and *Gossypium* (cotton) are very susceptible to *Verticillium* spp. attack. Disease management and plant protection is difficult since microsclerotia can last for more than 10 years in infected soil (Wilhelm, 1955). Obtaining more detailed knowledge of physiological responses on primary metabolism, as well as understanding source-sink relationships and assimilate distribution, carbohydrate transport or energy consumption upon fungal attack could contribute to developing strategies for vegetable gardening and breeding to prevent crop damage.

Generally, plant-pathogen interactions and induction of defence responses are energy intensive for plants (Bolton *et al.*, 2009). Consequently the demand for assimilates increase during infection. How do plants react on this higher energy demand? In comparison to leaf pathogens not much is known about the impact of soil-borne pathogens on the site of primary metabolism. The main goal of this study is to use a metabolic profiling approach to monitor metabolic changes in amino acid, carbohydrate and organic acid content in different tissues of tomato infected with *Verticillium dahliae*. Leaf and root samples of inoculated and non-inoculated plants were sampled at distinct time points, metabolites extracted, derivatized and analyzed by gas chromatography coupled to mass spectrometry (GC/MS). After comprehensive data acquisition and metabolite annotation samples from non-inoculated plants were compared with inoculated ones to identify differential metabolites upon fungal infestation. The data could help in better understanding the complex network of host response mechanisms upon soil-borne pathogen attack.

Wilhelm, S. (1955) Longevity of the Verticillium wilt fungus in the laboratory and in the field. *Phytopathology*, 45, 180–181. Bolton, D.M. (2009) Primary metabolism and plant defense – fuel for the fire. *MPMI*, 20, 487- 497.