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"Resilience of agricultural systems against crises"

Global Gene Expression of Rhizobacteria and/or Silicon Mediated Induced Systemic Resistance to *Ralstonia solanacearum* in Tomato (*Solanum lycopersicum*)

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Abstract

After priming tomato (*Solanum lycopersicum*) plants with silicon and/or the rhizobacterium *Bacillus pumilus* and later inoculating them with *Ralstonia solanacearum*, a transcriptome analysis of stem tissues was done to examine gene expression. A total of 174 genes were differentially regulated of which 113 were up-regulated and 61 down-regulated. Functional categorisation of these genes revealed that most of the up-regulated genes were involved in signal transduction, defence, protein synthesis and metabolism, while a large proportion of down-regulated genes were involved in metabolism, photosynthesis, signal transduction and lipid metabolism. Silicon priming up-regulated defence related genes and transcripts belonging to the salicylic acid dependent pathway which leads to induction of systemic acquired resistance (SAR). Defence related genes such as peroxidase, PAL and PR proteins were up-regulated in *B. pumilus* primed plants. A greater number of defence related genes were up-regulated in silicone primed plants than in *B. pumilus* primed plants. When plants were primed with both silicone and *B. pumilus*, five genes were down-regulated which were up-regulated when plants were primed with either silicone or *B. pumilus*. This suggests an antagonistic interaction between genes, which was mediated by ethylene-jasmonate and salicylate pathways. In all the tested combinations, inoculation of *R. solanacearum* to the primed plant was decisive: the effect of silicon priming will only manifest in the presence of the pathogen. This was also observed in previous enzyme assays and ad planta experiments.

In conclusion, separate applications of either silicone or *B. pumilus* is recommended over their combined application for the induction of resistance to *R. solanacearum* in tomato, with silicon being the stronger resistance inducer than *B. pumilus*.

Keywords: Ethylene, jasmonic acid, priming, Ralstonia solanacearum, rhizobacteria, signal transduction, silicon, *Solanum lycopersicum*, transcriptome

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