Tropentag, September 14-16, 2010, Zurich

"World Food System —
A Contribution from Europe"

Phenotypic and Molecular Background of Resistance Induction by Single and Combined Application of Chitosan and Silicon in Tomato against *Ralstonia solanacearum*

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Abstract

Bacterial wilt caused by *Ralstonia solanacearum* [syn. *Pseudomonas solanacearum*] is one of the most destructive diseases of tomato as well as of other commercially important crops such as eggplant, potato, peanut, banana, tobacco, ginger and geraniums. Its wide host range, geographical distribution and subsequent colonisation of different environments worldwide imposes a production problem. Different control strategies ranging from cultural, chemical and regulatory measures and resistance breeding have been used, but an effective control was not achieved. Therefore, enhancing plant resistance seems to be a potential approach to suppress the pathogen.

We investigated the effects of silicon which is shown to prime the defence capacity of treated silicon-non-accumulator plants against the pathogen, and possible synergistic effects when combined with chitosan a natural extract and an homopolymer of deacetylated ß-1, 4-linked N-acetylglucosamine extracted from exoskeletons of crustaceans, mainly shrimps. Evaluations of symptom development in terms of disease incidence/severity (AUDCP) revealed a reduction of 74 % and 47 % in tomato genotype King Kong 2 (moderately resistant) and L390 (moderately susceptible), respectively. The number of bacterial in midstems quantified as colony forming units (CFU/g FW) resulted in the highest reduction of 42 % in King Kong 2 for the three replications conducted at different times. Moreover, effects on plant growth and development evaluated as fresh/dry weight revealed high significant differences between silicon-chitosan treatments and non-treated plants, indicating a possible synergistic effect of the two elicitors. To further confirm the elicitor-induced systemic resistance at molecular level, microarray experiments for global gene expression (transcriptomics) and quantitative real time PCR to quantify the level of expression of target genes involved in resistance signalling pathways in planta are being performed.

These results contribute to the development of new, integrated practices for the control of the soil borne bacterial pathogen *Ralstonia solanacearum* and provide an outlook to further investigate synergistic use of elicitors. Should these results be reproducible under field conditions, they can open new opportunities to study effects of chitosan and silicon on other difficult-to-control plant diseases.

Keywords: Chitosan, induced resistance, *Ralstonia solanacearum*, tomato, transcriptomics

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