THE EFFECT OF TEMPERATURE ON *BACILLUS AMYLOLIQUEFACIENS* STRAIN S499 AND ON ITS INTERACTION WITH CROP PLANTS

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Although the world is facing climate changes, little is known about the effect of temperature on several biocontrol mechanisms shared by plant beneficial bacterial strains. *Bacillus amyloliquefaciens* strain S499 protects plants against several phytopathogenic fungi by producing surfactins. These amphiphilic cyclic peptides are involved in bacterial motility, biofilm formation and root colonization and directly interact with plant cells triggering Induced Systemic Resistance (ISR). The effect of low and high temperatures either combined with or without water stress on S499 and on its interaction with plants has been evaluated in this work.

In vitro tests showed that S499 growth at 15 and 20°C was characterized by a much longer lag-phase compared to 35°C. As consequence, swimming and swarming motility of strain S499 was drastically impaired when it was incubated at 15°C. Additionally, exposure at 15°C also incited a reduction in biofilm formation in comparison with 25 and 30°C. Intriguingly, temperature influenced the structure of biofilm and pellicles at air-liquid interface developed when the bacterium was incubated at 35°C only.

ISR experiments were carried out in greenhouse to assess the effects of temperature (15, 25 and 35°C) and water stress on the ability of S499 to trigger ISR in bean, tomato and zucchini plants. Root treatment with S499 significantly reduced disease severity in all tested conditions. The highest protection levels (up to 65%) were observed on S499-treated bean and tomato plants grown at 15 and 35°C. Interestingly, no differences in the efficacy of plant protection were observed between plants normally watered and those submitted to drought at any of the tested temperatures. This suggests that the decrease in ISR efficiency due to water stress can be relieved by application of S499.

Since no differences in S499 plant root colonization was observed within plants exposed at different temperatures, the effect of temperature on *in planta* production of surfactins by S499 was investigated in order to explain the different protection levels reached at the temperature values used ISR experiments. Interestingly, the quantities of surfactin produced at 15 and 35°C on the roots of tomato and bean plants were higher than at 20 and 28°C. This fits well with the higher ISR-mediated protection level observed at these temperatures and clearly supports the involvement of surfactins in ISR triggered by S499 in these two host plants. Results achieved in this work represents a first step in understanding how different temperatures may affect the interaction between plants and a beneficial bacterium. In the case of S499 it seems that both high and low temperatures do not negatively affect colonization of plant roots and, more importantly, the ability to trigger ISR in plants.