## PROJECT TITLE

Plant growth-promotion and quorum quenching activity of halotolerant bacteria: metabolomic and enzymatic approaches in tomato plants

## CONSORTIUM

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# SUMMARY OF THE REPORT

Increasing world food demand together with soil erosion, the indiscriminate use of chemical fertilization and the major threat of phytopathogenic bacteria to food production highlight the need to adopt sustainable crop production strategies. In this context, a combination of plant growth-promoting bacteria (PGPB) and pathogen management represents a sustainable and efficient alternative. Halophilic and halotolerant PGP strains could be a beneficial plant growth promotion strategy for saline and non-saline soils. Quorum quenching (QQ) involves the enzymatic degradation of phytopathogen-generated signal molecules, constituting an environmental-friendly strategy to fight several phytopathogens.

In this study, we investigated the PGP activity and the capacity of three halotolerant bacteria from *Peribacillus, Pseudomonas* and *Staphylococcus* genera to act as biocontrol agents against *Pseudomonas syringae* pv. *tomato* DC3000 by QQ or by the induction of plant systemic resistance (ISR). The PGP activity of these strains was analysed in tomato plants through metabolomic and enzymatic phenotyping of major carbon compounds including organic acids, amino acids, main sugars, chlorophylls, together with enzymatic activity. The same study was performed in tomato plants irrigated with each PGP strain and later challenged with the pathogen for ISR (irrigation group) or treated with a coculture of these strains and the pathogen (coculture group).

In terms of PGP traits, plants treated with the three strains showed a significant increase of amino acids and proteins, while starch was decreased with respect to the control treated with water, and organic acids and glucose tend to be variable. With respect to the enzymatic activity, a significative increase in cell wall invertase, ribulose 1,5-bisphosphate carboxylase/oxigenase (RuBisCO) and nitrate reductase was detected and a decrease of acid invertase was observed.

About biocontrol experiments, plants from irrigation group showed a significant increase of sugars, starch and citrate, while malate was variable. Plants from this group exhibited an increase of acid invertase, a variable effect in RuBisCO and a decrease in glucose-6-phosphate dehydrogenase and NAD-glutamate dehydrogenase activities. Samples from coculture group mainly showed a decrease in amino acids, proteins, fructose and sucrose, with respect to those treated with the pathogen alone. By contrast, starch, malate and citrate were significantly increased. Considering the enzymatic activity, only NAD-glutamate dehydrogenase activity was homogeneously increased, whereas the impact on glucose-6-phosphate dehydrogenase and NADP-glyceraldehyde-3-phosphate dehydrogenase was variable depending on the coculture.

Further analysis of these results using multivariate analysis will provide a better view of the impact of these bacterial strains in tomato PGP as well as the mechanisms implied in the reduction of *P. syringae* pv. tomato virulence.