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Molecular Interactions between Vicia Faba L. Cultivars and Plant Growth Promoting Rhizobacteria (PGPR), Utilized as Yield Enhancing 'Plant Probiotics'

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Abstract : The excessive use of pesticides and fertilizers has significant environmental and human health-related negative effects. In the frame of the development of sustainable agriculture practices, especially in the context of extreme environmental changes (climate change), it is important to develop alternative practices to increase productivity and biotic and abiotic stress tolerance. Beneficial bacteria, such as symbiotic bacteria in legumes (rhizobia) and symbiotic or free-living Plant Growth Promoting Rhizobacteria (PGPR), which could act as "plant probiotics", can promote plant growth and significantly increase the resistance of crops under adverse environmental conditions. In this study, we explored the symbiotic relationships between Faba bean (Vicia faba L.) cultivars with different PGPR bacteria, aiming to identify the possible influence on yield and biotic-abiotic phytoprotection benefits. Transcriptomic analysis of root and whole plant samples was executed for two Vicia faba L. cultivars (Polikarpi and Solon) treated with selected PGPR bacteria (6 treatments: B. subtilis + Rhizobium-mixture, A. chroococcum + Rhizobium-mixture, B. subtilis, A. chroococcum and Rhizobium-mixture). Preliminary results indicate a significant yield (Seed weight and Total number of pods) increase in both varieties, ranging around 25%, in comparison to the control, especially for the Solon cultivar. The increase was observed for all treatments, with the B. subtilis + Rhizobium-mixture treatment being the highest performing. The correlation of the physiological and morphological data with the transcriptome analysis revealed molecular mechanisms and molecular targets underlying the observed yield increase, opening perspectives for the use of nitrogen-fixing bacteria as a natural, more ecological enhancer of legume crop productivity.

Keywords : plant probiotics, PGPR, legumes, sustainable agriculture
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