Short Communication

Streptomyces extracellular metabolites as potent agents to control phytopathogenic fungi

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ABSTRACT: Introduction: Phytopathogenic fungi, causal agents of some of the world's most serious plant diseases, can significantly reduce yields during large-scale agricultural production. For successful invasion of plant organs, pathogenic development is tightly regulated and specialized infection structures are formed. To further colonize hosts and establish disease, fungal pathogens deploy a plethora of virulence factors, which makes control solutions less and less powerful. Currently, there is an increasing public concern regarding the continued use of agrichemicals to control the phytopathogenic fungi. This awareness relies mainly in the noxious effects of the pesticides on the environmental and human health. Several efforts have been made to find less hazardous options for controlling these plant pathogens among which the biological control using the microorganisms has been demonstrated to be a feasible alternative, but it is not widely used on commercial scale. In the aim of searching new solutions against several phytopathogen fungi, our investigations were focused to explore the potential of new isolated Streptomyces strain, especially in the biocontrol of Pythium ultimum and Verticillium dahliae, using the bacterial metabolites of Streptomyces sp. TN258.

Abstract: After fermentation, the supernatant containing the bioactive metabolites was filtered to eliminate bacterial cells. Then, several in-vitro and in-vivo tests were performed to assess the efficacity of the treatment against the pathogens and to understand its mode of action. Several bimolecular and biochemical measurements are also made.

Results: The inhibitory effect of TN258 free cell supernatant against P. ultimum was evaluated. As result, by application of 50% (v/v) from 25 mg.ml⁻1 of concentration, mycelial growth was totally inhibited with hyphal destruction. At the same concentration, the oospores were distorted and the germination was completely stopped. In potato tubers, Streptomyces TN258 filtrated supernatant, applied 24 h before inoculation by P. ultimum (preventive treatment group) was able to significantly decrease pathogen

penetration by 62% and to reduce the percentage of weight loss by 59.43%, in comparison with non-treated group. As regard Verticilium dahliae biocontrol, the outcomes can be summarized as follow: The in-vitro study showed the power of Streptomyces TN258 supernatant in the inhibition of mycelial growth of the fungus, as well as their destructive effect on spores and microsclerotia. In-plant study, in greenhouse, extracellular metabolites of the strain Streptomyces TN258 against displayed curative effect against Verticillium wilt, and induce upregulation of the defence genes. Field study of the curative effect of the extracellular metabolites of the Streptomyces TN258 strain on Verticillium wilt naturally present in olive trees indicated a remarkable general improvement of the trees and the decrease of the number of microsclerotia present in the soil. Conclusion: The extracellular metabolites of Streptomyces TN258 are a promising eco-friendly solution to protect against P. ultimum potato tuber leak and to cure V. dahliae olive tree wilt.

Biography

Imen's speciality is the applied microbiology with an expanded knowledge of natural chemistry, biochemistry, and data analysis. On the context of technology transfer from academic to the industries, she is currently working as a research project manager. Her research is focusing on the control of psychrotrophic bacteria occurring in raw milk: Identification, predictive growth modelling, a structural and kinetic study of their heat-stable extracellular enzymes. She is also working on the prediction of processed milk shelf-life using machine learning approach.

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