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Biological Control of Mycotoxigenic Fungi in Cereals: A Successful Step to Food Safety

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Abstract

Fusarium Head Blight (FHB) is a devastating fungal disease of small grain cereals such as wheat and maize. This worldwide disease represents an obstacle to achieve food security and food safety due to its enormous effect in decreasing crop yield and the potential presence of mycotoxins, secondary toxic metabolites produced by the causative pathogen, *fusarium graminearum*, during crop infection. To overcome this problem, different strategies for FHB management have been proposed. Among them, biological control using non-pathogenic microorganisms is greatly encouraged as eco-friendly, safe and sustainable long-term solution (1). However, survival of these biocontrol agents in practice often still lags behind. The close association of beneficial endophytic fungi with the plant might be an interesting trait to guarantee a better survival in the rhizosphere. Despite crop residues play a crucial role in the disease incidence being a source for primary inoculum of *fusarium graminearum*, we hypothesised that they might also harbor valuable antagonistic fungi.

In the current project, several novel fungal endophytes from maize residues have been isolated and afterwards tested for the first time to control the pathogen growth and mycotoxin production using different *in vitro* and in planta assays. The obtained results exhibited that the selected biocontrol endophytes have a promising effect to successfully control the infection. Furthermore, measuring the mycotoxin (deoxynivalenol, 15-acetyldeoxynivalenol, deoxynivalenol-3-glucoside and zearalenone) levels in the plant through a validated multi-mycotoxin LC-MS/MS method, the selected biocontrol endophytes had also an inhibitory effect on their production. Currently, a non-targeted metabolomics approach, with Q-TOF LC/MS, is being used to unravel the underlying mechanisms which will eventually optimise the implementation of these biocontrol gents in the field. The project will contribute to a great extend to reduction of fusarium infection and their mycotoxin levels in grain cereals especially wheat and maize.

Keywords: Biological control, Fusarium, mycotoxins

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