Warsaw, April 14, 2025

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Doctoral thesis entitled: **"The role of metabolic pathways in*Trichoderma* fungi for the degradation/transformation of *Fusarium* mycotoxins and their relevance to food safety"**

Abstract

Plant diseases in cereal crops caused by fungi of the genus *Fusarium* pose a significant threat to global food security. In response to these challenges, research into the antagonistic properties of fungi of the genus *Trichoderma* offers promising solutions for the biocontrol of these pathogens.

The objective of the study was to identify potential candidates among *Trichoderma*isolates with antagonistic properties against cereal pathogens belonging to the genus *Fusarium*. The research evaluated the extent of inhibition of mycotoxin biosynthesis by these pathogens and assessed the potential for biotransformation of selected mycotoxins by *Trichoderma* fungi. The study encompassed an evaluation of the antagonistic properties of selected isolates of various *Trichoderma* species in co-culture tests, analysis of the inhibition of mycotoxin biosynthesis by *Trichoderma*, fungal DNA analysis in the culture medium, and metabolomic analysis of the culture media.

All tested *Trichoderma*isolates demonstrated the ability to inhibit the growth of pathogens, with the strongest antagonistic activity observed in *T. atroviride*isolates. The *Trichoderma*isolates effectively reduced the levels of biosynthesized trichothecenes, fumonisins, beauvericin, zearalenone, and their derivatives. Metabolomic analysis revealed significant differences in the number and types of metabolites produced, depending on the specific *Trichoderma*isolate and *Fusarium* isolate, as well as the ability of *Trichoderma* to biotransform T-2 toxin and zearalenone.

The research confirmed that *Trichoderma* possesses significant potential as a biocontrol agent against *Fusarium*, demonstrating the ability to inhibit pathogen growth, reduce biosynthesis, and biotransform mycotoxins. These findings suggest that the application of *Trichoderma* could represent an effective and environmentally friendly strategy for managing mycotoxins in the food chain, thereby contributing to enhanced food safety. This research serves as a precursor to further in vivo studies aimed at confirming the efficacy and practical application of *Trichoderma* under real agricultural conditions.

Keywords:interfungal interactions, antagonism,metabolomic analysis, biocontrol

14.04.2025