



## The importance of *Trichoderma* and *Clonostachys* species in wheat protection against toxigenic pathogens belonging to the *Fusarium* genus

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### Abstract

*Fusarium* species are cosmopolitan necrotrophic pathogens of cereals and many other plants causing e.g. head blight, crown rot, foot rot, seedling blight, root rot. *Fusarium* head blight (FHB=scab) has been known for more than 100 years and is one of the most important diseases of wheat and other grain cereals and leads to significant loss of grain yield. In Europe it is caused mostly by *F. graminearum*, *F. culmorum*, *F. avenaceum* and *F. poae*. Other *Fusarium* species are less important due to their lower incidence and aggressiveness. To the most important and dangerous fungal secondary metabolites produced by those species are, e.g. deoxynivalenol (DON), nivalenol (NIV), zearalenone (ZEA) and moniliformin (MON) and their derivatives. The most common in Poland *Fusarium graminearum* and *F. culmorum* species are producers of trichothecenes and zearalenone while *F. avenaceum* produces moniliformin and enniatins. The consumption of contaminated cereal products may cause several serious diseases called mycotoxicosis. Research of the antagonistic microorganisms limiting the spread of *Fusarium* genus, allowed us to select the fungi belonging to the *Trichoderma* and *Clonostachys* species. Those organisms both, in the laboratory and field experiments proven to be effective in limiting *Fusarium* infestations and protect the wheat crops. To test the impact of *Trichoderma* and *Clonostachys* isolates on the toxigenic species: *Fusarium graminearum*, *F. avenaceum* and *F. culmorum* several field and bioassay experiments were performed. During the bioassay tests *Trichoderma* and *Clonostachys* isolates effectively decreased the amount of mycotoxins in rice cultures, while in field experiments their efficacy was highly variable and largely dependent on the weather conditions during preinoculation and inoculation stages. The effectiveness *Trichoderma* and *Clonostachys* isolates varied also between tested wheat varieties. Production of five trichothecene mycotoxins: deoxynivalenol (DON), nivalenol (NIV), their derivatives (3AcDON, 15AcDON, FUSX) and two additional toxins: moniliformin and zearalenone was most effectively reduced (over 95 -100% ) by strain *Trichoderma atroviride* (AN 35).