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BIOTECHNOLOGICALLY RELEVANT ENZYMES AND PROTEINS

The antifungal protein AFP from *Aspergillus giganteus* prevents secondary growth of different *Fusarium* species on barley

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Abstract Secondary growth is a common post-harvest problem when pre-infected crops are attacked by filamentous fungi during storage or processing. Several antifungal approaches are thus pursued based on chemical, physical, or bio-control treatments; however, many of these methods are inefficient, affect product quality, or cause severe side effects on the environment. A protein that can potentially overcome these limitations is the antifungal protein AFP, an abundantly secreted peptide of the filamentous fungus *Aspergillus giganteus*. This protein specifically and at low concentrations disturbs the integrity of fungal cell walls and plasma membranes but does not interfere with the viability of other pro- and eukaryotic systems. We thus studied in this work the applicability of AFP to efficiently prevent secondary growth of filamentous fungi on food stuff and chose, as a case study, the malting process where naturally infested raw barley is often to be used as starting material. Malting was performed under lab scale conditions as well as in a pilot plant, and AFP was applied at different steps during the process. AFP appeared to be very efficient against the main fungal contaminants, mainly belonging to the genus *Fusarium*. Fungal growth was completely blocked after the addition of AFP, a result that was not observed for traditional disinfectants such as ozone, hydrogen peroxide, and chlorine dioxide. We furthermore detected reduced levels of the mycotoxin deoxynivalenol after AFP treatment, further supporting the fungicidal activity of the protein. As AFP treatments did not compromise any properties and qualities of the final products malt and wort, we consider the protein as an excellent biological alternative to combat secondary growth of filamentous fungi on food stuff.

Keywords Antifungal protein AFP · Barley · Malting · *Fusarium* · Mycotoxin · Bio-control

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Introduction

The antifungal protein AFP, a secretory protein of the filamentous fungus *Aspergillus giganteus*, is a small, cysteine-rich protein that bears great potential for future antifungal strategies. The main advantage of AFP is its