AGRICULTURAL APPLICABILITY OF *NEOSARTORYA FISCHERI* ANTIFUNGAL PROTEIN AND *DE NOVO* DESIGNED PEPTIDE DERIVATIVES

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Pesticide-resistant filamentous fungi are known as emerging and destructive pathogens of agriculturally important plants causing billions of Euro loss in every year. Within pre- and postharvest conditions, they can contaminate feeds and foods with mycotoxins which pose severe risk on animal and human health as teratogens, mutagens, carcinogens, and allergens. Furthermore, resistance development against azole fungicides used in agricultural fields is responsible for medical treatment failure in azole-naive patients suffering from fungal infection. Therefore, there is a substantial demand for development of fundamentally new and safely applicable antifungal strategies to prevent and treat fungal infections for sustainable agriculture. In the present study we demonstrated that the *Neosartorya fischeri* antifungal protein (NFAP) and its rational *de novo* designed peptide derivative spanning the evolutionary conserved and antimicrobial active γ-core peptide motif provide feasible bases for this purpose. In *in vitro* susceptibility tests, NFAP effectively inhibited the growth of different plant pathogenic fungi belonging to genera *Aspergillus*, *Botrytis*, *Cladosporium*, and *Fusarium*. The synthesized, negatively charged and less hydrophilic native γ-core-peptide did not show any antifungal activity, but its positively charged and more hydrophilic rationally designed variant (NFAPimpγ) proved to be antifungal active. Further susceptibility tests demonstrated that the antifungal activity of NFAPimpγ did not depend on the primary structure and hydrophobicity, and the positive net charge was responsible for the antifungal effect. NFAP and NFAPimpγ did not influence the

viability of human cell lines (keratinocytes, intestinal epithelial cells and leukocytes), did not cause haemolysis *in vitro*, and was not toxic to *Medicago truncatula* germlings when applied at double minimal inhibitory concentration.

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