Novel Peptide-Based Inhibitors for Microtubule Polymerization in Phytophthora capsici

The plant disease Phytophthora blight, caused by the oomycete pathogen Phytophthora capsici, is responsible for major economic losses in pepper production. Microtubules have been an attractive target for many antifungal agents as they are involved in key cellular events such as cell proliferation, signaling, and migration in eukaryotic cells. In order to design a novel biocompatible inhibitor, we screened and identified inhibitory peptides against alpha- and beta-tubulin of P. capsici using a phage display method. The identified peptides displayed a higher binding affinity (nanomolar range) and improved specificity toward P. capsici alpha- and beta-tubulin in comparison to Homo sapiens tubulin as evaluated by fluorometric analysis. One peptide demonstrated the high inhibitory effect on microtubule formation with a nanomolar range of IC₅₀ values, which were much lower than a well-known chemical inhibitor—benomyl (IC₅₀ = 500 µM). Based on these results, this peptide can be employed to further develop promising candidates for novel antifungal agents against Phytophthora blight.

Keywords
Phytophthora blight; Phytophthora capsici; Phage display; Peptide; Microtubules

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