

ARE CYSTEINE AND ITS DERIVATIVES APPLICABLE FOR THE PREVENTION OF FUNGAL DISEASES?

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ABSTRACT

Many filamentous fungi are destructive pathogens of plants and are thus responsible for enormous crop losses worldwide. Therefore, there is a substantial demand for safely applicable, new compounds with extensive antifungal activity. Cysteine and its derivatives are interesting from this respect, as they have effective inhibitory potential against microorganisms and do not harmful effect on animal and plant cells.

Cysteine is a non-essential amino acid, which is an important structural and functional component of many proteins and enzymes. Previous studies demonstrated that cysteine and N-acetyl-cysteine have also been shown to exert antifungal activity.

A number of members of the class Zygomycetes are important as postharvest pathogens of agricultural products; *Rhizopus*, *Mucor* and *Gilbertella* species are among the most frequently isolated causative agents of fungal rots.

In this study we investigated the *in vitro* antifungal activity of cysteine (D- and L-cysteine) and its 4 derivatives (L-cysteine-methyl-ester, N-acetyl-cysteine, N-isobutyryl-D-cysteine and N-isobutyryl-L-cysteine) against 20 zygomyceteous fungal isolates representing 16 genera (*Actinomucor*, *Backusella*, *Gilbertella*, *Lichtheimia*, *Micromucor*, *Mortierella*, *Mucor*, *Mycotypha*, *Phycomyces*, *Rhizomucor*, *Rhizopus*, *Saksenaea*, *Syncephalastrum*, *Thamnostylum*, *Umbelopsis* and *Zygorynchus*).

The inhibitory potential of different concentrations (ranging from 0.625 to 10 mM) of the cysteine and its derivatives were investigated on the germination of sporangiospores and on hyphal extension by broth microdilution method and agar plate test. Cysteine and its derivatives showed a strong inhibitory effect against the most studied strains. Treatment with 10 mM of compounds resulted total growth inhibition in case of some isolates. Severe changes in colony morphology and hyphal growth were observed in presence of 10 mM L-cysteine, N-acetyl-cysteine and N-isobutyryl-L-cysteine when a strain was sensitive to them. Ten mM N-acetyl-cysteine induced dramatic modifications in the structural organization of the hyphae in case of *Rhizopus stolonifer*.

The above mentioned features of the investigated compounds could make them favourable antifungal agents against Zygomycetes in agricultural respect in the future, but it is needed further studies to prove their practical efficiency, for example in plant model experiments.

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Keywords: antifungal effect, cysteine, cysteine derivatives, Zygomycetes, microscopic observation