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Bioactivity of Guttation Droplets from Coal-Related Fungi

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Extended Abstract

Microfungi produce a wide range of diverse bioactive metabolites. Many of them can be useful in biotechnology and pharmacy. Like other novel molecules from natural sources, they can help combat some global problems, such as antibiotic resistance and cancer treatment failure [1]. Extreme and unexplored environments may constitute a valuable source of fungi with high antimicrobial and anticancer potential [2]. Special attention can be paid to fungal guttates, which are known to contain a plethora of secondary metabolites [3].

In the study, we evaluated ten microscopic fungi isolated from coal-related environments (coal lumps, mine water, and black soot) for their ability to secrete bioactive compounds into the guttation droplets. The isolates have been identified based on marker genes ITS, *TEF1-α* and *TUB2*, and divided into genera: *Aspergillus*, *Gliomastix*, *Penicillium*, *Simplicillium* and *Trichoderma*. For optimisation of the guttation process, the fungi were grown on various media and incubated in temperatures 7, 17 and 27°C. The droplets formed at the top of mycelium were collected and subsequently subjected to bioassays. The antibacterial and antifungal activities of the exudates were evaluated using agar well-diffusion assay [4] against selected Gram-positive and Gram-negative bacteria, yeast and filamentous fungi. The anticancer activity was tested using MTS method [5], on the brain (LN-229) and breast (MCF-7) cancer cell lines.

The guttation exudates secreted by *Penicillium* sp. MW-W400-5(F), *Trichoderma* sp. Cin-9, *Simplicillium* sp. MW-W600-40A and MW-W600-39 showed antibacterial activity towards *Bacillus subtilis*, *Staphylococcus aureus* and *Yersinia enterocolitica*, as well as antifungal effect against yeast *Candida albicans*. Moreover, the guttates of two fungal strains, *Aspergillus* MW-W600-11 and MW-W200-2, exhibited promising anticancer activity on the brain (LN-229) and breast (MCF-7) cancer cell lines *in vitro*. Additionally, they showed high selectivity, as they were significantly less toxic towards non-cancer cells, normal human dermal fibroblasts.

The most active exudates are being subjected to further, chemical analyses. Chemical composition of their exudates is being investigated using liquid chromatography-mass spectrometry to identify potentially bioactive metabolites. While, genomes of the fungi were sequenced, and bioinformatic analysis in terms of biosynthetic genes detection is ongoing. Our current results showed that coal-related fungi could be a promising resource of new metabolites with antimicrobial and anticancer properties.

Keywords: bioactive compounds, coal-related fungi, fungal guttation

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