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Heterogeneity of metabolites excreted by fungal, bacterial and fungal-bacterial biofilms

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Abstract: Environmental conditions and physical interactions among microbial cells may alter the metabolites released by them. The present study examined the functional differences of metabolites excreted by three biofilms viz., a fungal biofilm of *Aspergillus* sp. (FB), a bacterial biofilm of *Enterobacter* sp. (BB), and their mixed-culture biofilm (FBB). All three biofilms were formed under *in vitro* conditions and their cell-free exudates were analyzed for functional properties using Fourier Transform Infrared (FTIR) spectroscopy. During the data analysis, FTIR spectrogram was divided into five windows (W1-W5) such as W1, 2800 - 3000 cm-1; W2, 1500 - 1800 cm-1; W3, 1200 - 1500 cm-1; W4, 900 - 1200 cm-1; W5, 500 - 900 cm-1. The data were extracted from each window and analyzed by cluster analysis to see the similarities and differences among data. Functional molecules produced by the FBB were clustered separately, showing the distinctiveness of molecules produced by FBB. All three biofilms showed a higher accumulation of functional molecules during their mature stages rather than in the early stages of their development. The study emphasizes the importance of developing specific biofilms for improved metabolic activities over microbes at the species level.

Keywords: Biofilms, Metabolites, FTIR