Cellulase Activity of Fungal and Bacterial Isolates and their Fungal-bacterial Biofilms

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Enzymes are crucial in speeding up many biological reactions, but the lack of suitable sources to extract them with high productivity in low cost is a constraint. Present study designed in order to evaluate the cellulase production by some fungal and bacterial isolates and their fungal-bacterial biofilms (FBBs). Five fungal (F1-F5) and 27 bacterial (B1-B27) strains were isolated from soil samples collected from a municipal garbage dump near Vincent Dias Stadium, Badulla, Sri Lanka. All bacterial isolates were screened for cellulase activity using Congo Red Agar medium. Two strains (B6 and B15) with significant ($p \leq 0.05$) cellulase activity were selected along with all fungal strains for biofilm formation. Accordingly, ten fungal-bacterial combinations (F1B6, F1B15, F2B6, F2B15, F3B6, F3B15, F4B6, F4B15, F5B6, F5B15) were used for the formation of biofilms under in vitro conditions. The biofilm formation was monitored regularly through microscopic means. On day four, three successful biofilms (B6F1, B15F1 and B15F4) were resulted with bacterial cell attachment to mycelia. These three mixed-culture biofilms and their monoculture counterparts were re-cultured in Czapek-Dox broth with the culture medium alone as a control. On day four , a portion of the broth was centrifuged and the supernatant was used as the crude cellulase extract. The extracts were then tested for their efficacy through a well diffusion assay using Carboxymethyl Cellulose agar medium in a Complete Randomized Design with three replicates. The diameters of the clear zones around the wells were measured and the data were analyzed by one-way ANOVA and t-test. The B15F1 showed a significantly higher cellulase activity over F1, the second highest cellulose producer ($p = 0.02$). F3 and F4 also showed considerably high levels of cellulase activity. The least cellulase activities were shown by B6 and B15. Thus, the fungal-bacterial biofilm B15F1 can be introduced as a potential source for bulk extraction of cellulases. However, further studies are needed to find out the optimal maturation stage with the highest cellulase activity of the biofilm, B15F1.

Keywords: Cellulase; Bacteria; Fungi; Fungal-bacterial biofilms

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