Degradation of Cellulose and Pectin in Organic Wastes by Developed Fungal-Bacterial Biofilms

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An organic waste consists of cellulose and pectin which are resistant to rapid degradation due to their complexity. The objective of this study was to find out the most efficient fungal-bacterial biofilm/s (FBB/s) for the organic waste degradation. Pectinolytic and cellulolytic activity of isolates were tested by standard plate assays and best strains were used to develop 25 FBBs. The best FBBs were selected based on the physical attachment of bacterial cells to fungal filaments (light microscopic observations), and those were symbolized as F3B1, F5B1, F2B2, F3B2, F3B3, F4B3, F2B5 and F3B5. Coffee silver skin, barely skin and rice husk were the organic wastes used. Developed FBBs were inoculated separately to 10 g of above wastes in petri dishes and were incubated for 40 days. The control was maintained without FBBs inoculation. Three replicates were maintained for each treatment and the experiment was arranged in a completely randomized design. The mass reduction, Fourier Transform Infrared Spectroscopy (FTIR) and sugar accumulation of samples were analyzed within five day intervals. Data were analyzed by ANOVA. Results revealed that in the 40th day, the sugar production was highest in barley husk treated by F3B5. In coffee silver skin, the sugar accumulation was similar under all FBBs. In rice husk, F3B1 showed the highest sugar level in 15th day, but F4B3 dominated on the 25th day. The mean weights of the samples decreased with time, but after 25th day they came into a plateau with having 0.1-0.3 % weight loss percentage. According to FTIR data, all FBBs except F3B3 showed the degradation of barely husk. F2B5 was the best in terms of weight loss during the last five days of incubation. F4B3, F3B2 and F5B3 were the best biofilms in terms of weight loss at the end of 10th, 15th and 20th days, respectively. It can be concluded that F3B3 and F3B2 were the best FBBs for degradation of all three types of organic wastes.

Keywords: Cellulose, Pectin, Degradation, Organic waste, Fungal-bacterial biofilm