EVOLUTION OF AN INTRODUCED BIOFILMED BIOFERTILIZER IN A MICROBIAL ENVIRONMENT

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Conventional agriculture has disrupted the natural biodiversity and ecosystems necessitating sustainable methods of agriculture to restore them. Recent studies have used Microbial Biofilms (BF) as biofertilizers, known as Biofilmed Biofertilizers (BFBFs), to reinstate biodiversity of degraded agro-ecosystems. Present study investigates the improvement of microbial diversity and functionality after introducing BFBFs to a microbial environment and the effect of BFBFs on root endophytic colonization. The first experiment included three treatments (BF, soil solution and BF with soil solution) and a control (Biofilm formation medium) with five replicates laid in a Completely Randomized Design. Fourier Transformed Infrared (FTIR) spectra were recorded for exudates and microbial cultures isolated from diluted treatments at the beginning and after seven days of incubation. The second experiment used hydroponically grown rice under sterile conditions as the test plant. The hydroponic medium with the test plant was inoculated with BF whereas the control had no BF. Root biomass was measured after three weeks. Endophytes were isolated to obtain colony diameter and FTIR spectra. Results were subjected to statistical analysis. Amide content in exudates of BF plus soil solution was significantly higher than that of BF or soil solution alone *($p=0.01$)*. This shows an improved biochemical expression of nitrogenous compounds in microbial environments in the presence of BF. Rice root biomass *($p=0.02$)* and endophytically isolated bacterial colony diameter *($p=0.00$)* were significantly higher in the BF treatment than the others, possibly due to endophytic biofilm induction. Cluster analysis demonstrated the emergence of 6-10 new types of microbes in BF plus soil solution, and 1-3 new rice endophytes in BF treatment, possibly due to dormancy breaking of endophytic microbial seed bank by biofilm specific biomolecules. Therefore, the application of BFBFs to soil could induce soil microbial and root endophytic diversity and their functionality.

Keywords: Agro-ecosystem, Biodiversity, Biofilms, Endophytes, FTIR