Developing a Non Host-Specific Biofertilizer: A Microbial Biofilm Approach

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Host specificity of biofertilizers may pose several issues at large scale production and usage. The present study examined the universality of a fungal-bacterial biofilmed biofertilizer (BFBF) in comparison to its monoculture bacterial (BBF) and fungal (FBF) biofertilizers using three crops, Strawberry, Tomato and Rice. The BFBFs were formulated using strawberry (*Fragaria ananassa*) rhizosphere-associated bacterial (*Enterobactor* sp.) and fungal (*Aspergillus* sp.) strains. Strawberry, rice and tomato were grown in hydroponic medium with liquid biofertilizers (BFBF, BBF and FBF) applied at same ratio of biofertilizer: hydroponic medium in 1:9 ratio (in volume). A control was maintained in the hydroponic medium but without biofertilizers. The treatments were triplicated and arranged in a completely randomized design. The growth medium collected at different time intervals were analyzed for polysaccharides, amides and lipids by Fourier Transform Infra-red spectroscopy. Plant height and dry mass were recorded after a month. Data were analyzed by ANOVA and correlation. After 30 days, all crops showed significantly improved concentrations of polysaccharides, amides and fatty acids in media treated with BFBF, BBF and FBF over the control. The dry biomass and heights of strawberry and rice plants were significantly ($p<0.05$) higher in BFBF over the BBF, FBF and the control. In tomato, BFBF-treated seedlings also showed better growth, though not significantly. Concentrations of functional polysaccharides ($14^{th}$and 30^{th}days), fatty acids ($7^{th}$and 14^{th}days) and amides (30^{th}day) were positively and significantly correlated with the growth of strawberry plant. The growth of rice also showed a significant positive correlation with functional polysaccharides (14^{th} day), fatty acids and amides (30^{th}day). In tomatoes, a significantly positive correlation was noted with the functional polysaccharides, fatty acids and amides after 30 days. The findings suggest that the BFBF developed from strawberry root-associated microbes nullify the general concept of crop specificity by potentially improving the growth of rice and tomato. As such, the BFBF seems to have a higher ability to improve the growth of crops in comparison to conventional monoculture biofertilizers.

Key words: Biofertilizers, Biofilmed Biofertilizers, Host specificity, Universality