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Fungal-bacterial biofilms: promises, progress and prospects

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Abstract: Fungal-bacterial biofilms (FBBs) have created their unique place in the arena of biofilms, mainly through bacterial colonisation on biotic fungal surfaces. Formation of FBBs has shown the biofilm mode to possess enhanced metabolic activities compared to monoculture mode of the microbial life. FBBs have seen promising applications in environmental and agricultural settings as well as emerging avenues of enzyme technology and drug discovery. This has been amply demonstrated in the rhizosphere of plants, where applying biofilmed inocula produced by incorporating a N2-fixing strain to the FBB, shows improved nitrogen fixation in N-deficient agricultural settings. When inoculated directly to soil they also improved N and phosphorus availabilities. FBBs of beneficial endophytes also produced higher levels of acidity and plant growth promoting hormones than in the absence of FBBs. The bioremediation capabilities of FBBs have been further displayed by the successful rhizoremediation of heavy metal-contaminated soils. The successes in using FBBs in biofilmed biofertilizers have shown enhanced soil fertility and plant growth in numerous crops and ornamental plant species. This progress further resulted in the manufacturing of a successful commercial biofertilizer. From the promising technology this posed to be 2 decades ago, to the progress it has made over the years to the prospects of harnessing further multifaceted benefits in the future, FBBs no doubt mark its place in the sphere of biofilm based advances.

Keywords: Fungal-bacterial biofilms, Biofertilizers, Bioremediation, Rhizoremediation