Emergence of Diverse Microbes on Application of Biofilmed Biofertilizers to a Maize Growing Soil

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ABSTRACT
Diverse microbial communities in the rhizosphere perform an amazing role in plant growth and productivity. However, conventional agricultural practices such as the use of chemical fertilizer (CF) and tillage have collapsed the diversity of the microbial communities. Direct application of developed fungal-bacterial communities known as biofilmed biofertilizers (BFBFs) to the soil has been introduced recently, and observed to be multi-functional and more effective than conventional biofertilizers. However, the effect of such biofertilizers on soil microbial diversity has not been studied sufficiently world over. Therefore, the current study was carried out to investigate the effects of BFBFs on bacterial, cyanobacterial and fungal species in a maize growing soil. A pot experiment was conducted under greenhouse conditions with different fertilizer treatments; 100% chemical fertilizers (CF) recommended for maize, 50% CF, 50% CF + BFBF, and no fertilizer, as the control. Microbial species richness and abundance of bacteria were evaluated after two months of plant growth. Microbial biomass carbon (MBC) was estimated by using chloroform fumigation-extraction technique. Results showed that the species richness of bacteria, fungi and cyanobacteria, and abundance of bacteria were higher in 50% CF + BFBF, compared to 50% and 100% CF. This implies that the action of BFBFs tends to break dormancy of microbial seeds in the soil, resulting in emergence of a diverse microbial community, which may support natural biocontrol of pathogens. An interesting observation was the stimulation of an additional microflora of cyanobacteria by the application of BFBF. MBC levels did not show a significant difference between any of the treatments. We recommend further testing of the BFBFs for increasing microbial diversity and ecosystem functioning and hence the sustainability of maize cultivating agroecosystems.

Keywords: bacteria, cyanobacteria, fungi, Zea mays