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Rhizosphere Microbiome Involvement in the Natural Suppression of Soybean Cyst Nematode in Disease Suppressive Soil

Authors : M. Imran Hamid, Muzammil Hussain, Yunpeng Wu, Meichun Xiang, Xingzhong Liu

Abstract : The rhizosphere microbiome elucidate multiple functioning in the soil suppressiveness against plant pathogens. Soybean rhizosphere microbial communities may involve in the natural suppression of soybean cyst nematode (SCN) populations in disease suppressive soils. To explore these ecological mechanisms of microbes, a long term monoculture suppressive soil were taken into account for further investigation to test the disease suppressive ability by using different treatments. The designed treatments are as, i) suppressive soil (S), ii) conducive soil (C), iii) conducive soil mixed with 10% (w/w) suppressive soil (CS), iv) suppressive soil treated at 80°C for 1 hr (S80), and v) suppressive soil treated with formalin (SF). By using an ultra-high-throughput sequencing approach, we identified the key bacterial and fungal taxa involved in SCN suppression. The Phylum-level investigation of bacteria revealed that Actinobacteria, Bacteroidetes, and Proteobacteria in the rhizosphere soil of soybean seedlings were more abundant in the suppressive soil than in the conducive soil. The phylum-level analysis of fungi in rhizosphere soil indicated that relative abundance of Ascomycota was higher in suppressive soil than in the conducive soil, where Basidiomycota was more abundant. Transferring suppressive soil to conducive soil increased the population of Ascomycota in the conducive soil by lowering the populations of Basidiomycota. The genera, such as, Pochonia, Purpureocillium, Fusarium, Stachybotrys that have been well documented as bio-control agents of plant nematodes were far more in the disease suppressive soils. Our results suggested that the plants engage a subset of functional microbial groups in the rhizosphere for initial defense upon nematode attack and protect the plant roots later on by nematodes to response for suppression of SCN in disease-suppressive soils.

Keywords : disease suppressive soil, high-throughput sequencing, rhizosphere microbiome, soybean cyst nematode
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