SOIL MICROBIOTA REGULATION AND PLANT HEALTH

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Soil-borne diseases have become one of the main limiting factors of global crop production. Soil-borne Fusarium wilt, caused by the pathogenic F. oxysporum, has become one of the most serious soil-borne diseases threatening crop safety in the world. The composition and function of microbial communities in soil are key factors affecting plant growth and are of great significance for maintaining plant health. Soil microbial community is a complex multi-component collection, including bacteria, fungi and protist, and there are complex interactions between them. At present, the research on soil microbial community and disease suppression mostly focuses on bacterial and fungal communities, and lack of protistan communities and the protist-mediated interactions with other microbial communities in soil-borne disease-suppressing. Therefore, it is very important to study the characteristics of soil protistan communities and their mediated mechanisms of microbial community interactions in disease suppression. Our results showed that the long-term organic fertilizer inputs effectively increased the relative abundance of predatory protists. There are more predatory protists (such as Cercomonas) in the organic fertilizer treatment, which can effectively colonize the rhizosphere. The secondary metabolites of rhizosphere Bacillus, especially the antibiotics with antagonistic effect on pathogens, can effectively resist the predation of predatory protists, and the predatory protists in the rhizosphere further prey on other non- or antibiotic-producing ability weaker Bacillus, vacating the niche for Bacillus with stronger antibiotic-producing ability, promoting its effective colonization in the rhizosphere. Pathogen-antagonizing bacteria promoted by predation by predatory protists inhibit F.oxysporum by secreting more secondary metabolites (antibiotics that have antagonistic effects on pathogens). The interactions between rhizosphere predatory protists and Bacillus can effectively maintain a healthy rhizosphere microbial environment and promote plant health. Our research can provide support for artificially regulating soil microbial communities and their interactions, shaping a multi-trophic microbial control network, and inhibiting the occurrence of soil-borne diseases.

Keywords: Soil-borne disease, Organic fertilizer, Protist, Bacillus, Microbial interaction