

BENEFICIAL MICROORGANISMS FOR SUPPRESSION OF FUSARIUM WILT OF BANANA AND ITS PROMOTING FOR SUSTAINABLE PRODUCTION

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ABSTRACT

Fusarium wilt of banana, caused by *Fusarium oxysporum* f. sp. *cubense* (*Foc*), especially Tropical Race 4 (TR4), seriously threatens banana production worldwide. Biological control of banana fusarium wilt has received increasing attention. A tritrophic biocontrol interaction relationship of bacteria-pathogens-bananas is being proposed. Two biological control strains with strong antagonistic effect on TR4 were isolated from 256 banana plant samples from different planting areas in Yunnan. Through morphological, molecular, physiological, and biochemical characteristics identifying, they were identified as *Bacillus amyloliquefaciens* and *B. subtilis*. The TR4 suppression and plant growth promoting effects were conducted and the results showed that there was a significant TR4 suppressive effect of the two antagonistic bacteria, one of these two strains also could promote the banana growth. Following this, microscopic observation on the TR4 mycelial morphology was conducted during dual-culturing of five *Bacillus* strains which were isolated from Yunnan and Guangxi province. Conventional PCR method with thirteen pairs of specific biocontrol marker genes including seven NRPS genes, four PKS genes and two RPS genes in the genus *Bacillus* were used to detect the potential biocontrol genes. Real-time fluorescence quantitative detection system was also performed to detect twelve biocontrol marker-genes in *Bacillus* that confer TR4 antagonism. The next step involved the colonization of biocontrol bacteria in banana roots based on a broad-spectrum alliable transformation system which was developed in our laboratory. Further fluorescent observation by Laser Scanning Confocal Microscopy showed these RFP-labelled bacteria exhibit chemotaxis towards green fluorescent protein (GFP)-labelled TR4 hyphae in banana plants. To conclude, this can provide a new theory for the interaction between the biocontrol bacteria, *Foc* TR4 and banana plants, and provides new ideas for the biological prevention and control of banana wilt.

Keywords: Beneficial microorganisms, chemotaxis, Fusarium wilt of banana, suppression of Fusarium wilt of banana, tritrophic biocontrol interactions.