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The screening of rice endophytic biofertilizers with fungicide etridiazole, metalaxyl and tricyclazole tolerant ability

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Bacterial biofertilizers are those plant growths promoting rhizobacteria applied in the field to promote crop growth and to reduce the use of synthetic fertilizers. However, in conventional agriculture, the applying pesticides is a routine practice and is unavoidable to achieve reasonable profit. Thus, to develop effective bacterial biofertilizers, the effect of pesticides on plant growth promoting rhizobacteria (PGPR) should be considered before application. In this study, bacterial strains with both PGP traits and pesticide tolerant ability were isolated for selection as potential bacterial biofertilizers. Rice (*Oryza sativa*) seedlings were planted in the soils with high dose of fungicide etridiazole, metalaxyl, and tricyclazole applied. Endophytes were isolated from rice roots, and 16S rDNA sequence and related plant promoting characteristics including the potential nitrogen fixation, phosphorus solubilizing and indoleacetic acid (IAA) production ability for those endophytic bacteria were determined afterward. A total of seventeen different strains were isolated. Among them, five strains with both nitrogen fixation potentials and IAA production ability were identified. The species isolated included *Rhizobium larrymoorei* E2, *Bacillus aryabhatai* E7, *Bacillus aryabhatai* MN1, *Pseudomonas granadensis* T6, and *Bacillus fortis* T9. Except for T9, four strains out of five were even capable of tolerating two or more fungicides without retarding the growth rates. We inoculated the above four endophytic bacteria to the rice roots and confirmed that they were all equipped with rice growth promoting abilities. We applied recommendation rates of etridiazole and metalaxyl on the growth medium in *Bacillus aryabhatai* MN1 and found out that MN1 can produce high rates of IAA with fungicides applied. The bacteria strains isolated from this study presented PGP traits upon high rates of fungicides application and can be viewed as potential members in bacterial biofertilizers for sustainable agriculture application.

Strain	Fungicides inhibition ^a				Inoculation test ^b	
	Metalaxyl 9 ppm	Etridiazole 7 ppm	Tricyclazole 160 ppm	Fungicide mixture	Shoot growth	Root growth
E2	-	-	+	+	=	=
E7	-	-	+	N/A	=	=
MN1	-	-	-	-	=	=
T6	-	-	+	N/A	=	=
T9	-	+	N/A	N/A	N/A	N/A

^a The fungicides were amended with recommended dose.
^b "+" : inhibited by fungicide or seedling growth promoted;
 "-" : no inhibition effect, or no growth promoting effect;
 "=" : no significantly different between the control.
 "N/A": The experiments were not conducted.

Biography

Wen-Ching Chen is specialized in pesticides and environmental microbiology relationship research field. She was graduated from National Taiwan University, Taipei, Taiwan. Currently, she is an Assistant Professor in International Bachelor Program of Agribusiness, National Chung-Hsing University, Taichung, Taiwan.

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