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## Study of useful genes and metabolites from a plant– probiotic bacterium through the 'omics' technology

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Some strains of plant associated bacteria referred to as "plant–probiotic bacteria" can elicit plant growth promotion and induced systemic resistance (ISR) against plant pathogens. Many bacterial determinants have been proposed to account for growth promotion and ISR by these plant–probiotic bacteria. For elucidating mechanisms of plant growth promotion and plant protection against pathogens, plant growth regulators produced by PGPR and suppression of deleterious microorganisms including pathogens have been considered. Recently small molecules including volatile organic compounds from these bacteria were discovered to be primary determinants of both plant growth promotion and ISR in *Arabidopsis*. In our project, the objectives were to identify small molecular metabolites from *Paenibacillus polymyxa* strain E681 of which genome sequencing has been completed recently and to screen the metabolite for crops to be enhanced productivity and resistance. To achieve the objectives, we employed tobacco as a model system to assess growth promotion *in vitro* and in the greenhouse. Out of 19 bacterial small molecules from strain E681, two metabolites that showed consistent growth promotion effect under both *in vitro* and greenhouse condition were selected. This study demonstrates that small molecules produced by *P. polymyxa* can act an important role on growth promotion and ISR. After completing screening *in vitro* and in the greenhouse, the metabolite(s) will be valid for large scale application in the crop cultivation and for capacity of ISR.

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