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Yong Hoon Lee et al., J Plant Physiol Pathol 2017, 5:5
DOI: 10.4172/2329-955X-C1-012

3rd Global Summit on

Plant Science

August 07-09, 2017 | Rome, Italy

A blend of volatile compounds emitted from *Alcaligenes faecalis* modulated hormonal pathways and ion transporters to induce salt tolerance in *Arabidopsis thaliana*

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Volatile organic compounds (VOCs) from *Alcaligenes faecalis* JBCS1294 (JBCS1294) have been reported to induce tolerance againis salt stress in Arabidopsis thaliana by influencing the auxin and gibberellin pathways and upregulating the expression of key ion transporters. In the present study, we evaluated the contribution of each VOC and blends of the VOCs on the induction of salt tolerance and signaling pathways. The key VOCs emitted from JBCS1294 were dissolved in lanolin and applied to one side of bipartite I-plates that contained Arabidopsis seeds on Murashige and Skoog (MS) media supplemented with NaCl on the other side. Changes in plant growth were investigated using Arabidopsis mutant lines and hormone inhibitors, and gene expression was assessed by real-time PCR (qPCR). Among the VOCs, butyric acid conferred salt tolerance over a concentration range of 5.6 μM (10 ng) to 56 mM (100 μg), whereas propionic and benzoic acid were effective at micromolar doses. Intriguingly, the optimized cocktail of the three VOCs increased fresh weight of Arabidopsis under salt stress compared to that achieved with each single compound. However, Arabidopsis growth was not promoted by the VOCs without salt stress. Exogenous indole-3-acetic acid (IAA) application arrested salt tolerance or growth promotion of Arabidopsis induced by volatiles from propionic acid, but not from butyric acid and an optimized volatile mixture of butyric acid, propionic acid, and benzoic acid (1PBB). High and intense auxin-responsive DR5::GUS activity was observed in the roots of Arabidopsis grown on media without salt via 1PBB, butyric acid, and benzoic acid. Growth promotion by the cocktail was inhibited in the eir1 mutant and in Col-0 plants treated with inhibitors of auxin and gibberellin. The present study clearly demonstrated the effects of individual VOCs and blends of VOCs from a rhizobacterial strain on the induction of salt stress. The results with the blend of VOCs, which mimics bacterial emissions in nature may lead to a deeper understanding of the interaction between rhizobacteria and plants.

Biography

Yong Hoon Lee worked as a research scientist at Rural Development Administration (RDA) of Republic of Korea. During his stay in RDA, he studied for management of plant disease especially by focusing on biological control. In 2009, he moved into Chonbuk National University and his lab studies on the interaction between plants and pathogen (P. cichorii), interaction between plants and rhizosphere microbiome (PGPR), and interaction between plants and environment (light) by focusing on genomic and physiolocal responses between the factors

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