

Speaker Abstracts - Thursday 6 December

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Microbiome dynamics during enrichment culture on ACC as nitrogen source: relevance to controlled environment agriculture

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Controlled environment agriculture systems, such as hydroponic greenhouses and vertical farms, offer unprecedented opportunities for ensuring optimal microbiome composition for plant growth, product yield and quality, and resilience against disease-causing microbes. We have carried out microbiomic and metagenomic surveys of the fertigation systems of commercial vegetable greenhouses, and observe clear, crop-specific effects on microbial community structure. Rhizospheric conditions and characteristics are expected to result in enrichment effects. In this context, we are using macrobiotic analysis to investigating the enrichment of microbial communities by nutrients of importance in the plant-microbe interactions. The ability to degrade 1-aminocyclopropane-1-carboxylic acid (ACC), the immediate precursor to ethylene, is associated with many rhizospheric and endophytic bacteria that have plant beneficial effects. The key enzyme is ACC deaminase, which catalyzes the conversion of ACC to ammonia and α -ketobutyrate. As a result, ACC can serve as nitrogen and carbon source, and the resulting reduction of ACC levels reduces stress ethylene. Of interest is the role that ACC plays in shaping the phytobiome, and how this in turn influences crop health and productivity. As an initial step towards understanding this, we used 16S rRNA gene sequence analysis and metagenomics to investigate the community dynamics of soil enrichment cultures with ACC as nitrogen source, compared to ammonia. We found that the community became much more constrained on ACC, consistent with ACC metabolism being more of a specialized trait. The ACC-enriched cultures were able to promote plant growth.