Microbial assemblages of post-mining soils on Christmas Island: beneficial microbes for agricultural production

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Agricultural production in post-mining environments is becoming increasingly important globally as many regions are challenged with food security and post-mining land use legacies. Although there are

many advantages in pursuing agriculture at post-mining sites, these substrates have abiotic and biotic challenges for plant growth, including poor fertility, heavy metals, and a lack of beneficial soil microbes. To address the paucity of knowledge about endemic microbes post-phosphate mining on Christmas Island, we investigated the microbial assemblages of various post-mining substrates. Soil samples were collected from seven sites across the island, ranging from kiln-treated mine waste to post-mine soil already under agricultural production. Based on 16S and ITS gene sequence analysis, we identified microbial taxa, such as mycorrhizal fungi and rhizobial bacteria, that are likely to benefit agricultural production in these soils. These results will inform existing agricultural trials and provide insight into the most suitable post-mining environments for successful agriculture on the island. Our work also has important implications for other sites transitioning from mining to agriculture.

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AusME 2019

Australian Microbial Ecology Conference

11 - 13 February 2019

University of Western Australia

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