Speaker Abstracts - Wednesday 5 December

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How plants shape the rhizosphere: physiological adaptations, exudation, and metabolite uptake

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Plant roots not only associate with a core microbiome, but also with specific microbes defined by the host genotype. The plant traits leading to associations with microbes are still mostly enigmatic, but likely, root morphology and plant-derived metabolites are important, as they define the physical and chemical environment of the root. Importantly, plant morphology and metabolism are also influenced by microbes, and by soil properties.
Here, we investigated how the model grass Brachypodium distachyon shapes and is shaped by various environments by growing it in phosphate-sufficient or phosphate-deficient mineral media, or a sterile soil extract in a model growth system, the EcoFAB. We also assessed the reproducibility of the physiological and metabolic responses across four laboratories. Excitingly, all traits investigated were distinct between experimental conditions, and consistent across laboratories. For plants grown in soil extract, we also made a number of interesting findings: these plants exhibited elongated root hairs, a specific metabolic profile, and they depleted 50% of the investigated metabolites from the substrate. This suggests that plants not only release, but likely also take up a wide variety of compounds from their environment, significantly changing the metabolite availability for other organisms present. Our study highlights the importance of studying plants not only in standard laboratory, but also in more natural environments, and is a first step towards understanding how plants shape their interaction with microbes in the rhizosphere.