

Plant Chips for High-Throughput Plant Phenotyping

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Systematic characterization of plant phenotypes remains a major challenge due to their large genome sizes, and tens of thousands of genes that respond differentially to various external and internal stimuli. Because of this inherent complexity, analyzing plant phenotypes on a large and multi-scale level with sufficient throughput, resolution and precision has been difficult and expensive. Previous work has addressed this challenge to some extent, but these studies were mainly focused on phenotyping of roots. In our lab we developed a plant chip that is easy and cost-effective to use, and also enables seamless monitoring of both root and shoot phenotypes. We have provided a few examples and applications of the chip. The device design can be flexibly changed to enhance its application in the plant phenomics area. For example, plants can be grown over a long period of time, allowing for different and multiple types of genotypes to be simultaneously characterized at the physiological, biochemical and molecular level, and at various stages of growth. The second part of my talk is about the development of high-sensitivity, high-specificity nitrate sensors in our lab. The sensors have potential to measure nitrate level in the plant and nitrate ions leaving the plant.