Robin PSI PlantScreen™ system

https://search.researchequipment.wur.nl/SearchDetail.aspx?deviceid=12b2625e-3ee6-4a2f-bf8a-368ec1bbd28b

Brand

Photon Systems Instruments

Type

PlantScreen™ system

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Description

The Robin PSI PlantScreenTM system is a stand-alone device and can be used to digitally ‘phenotype’ individual plants in pots up to 50 cm plant height or trays with max. 20 small plants, for instance Arabidopsis for a range of traits. The Robin PSI can be easily transferred to a climate room or a greenhouse compartment, to accommodate easy access from running experiments. The Robin PSI is equipped with three sensors:
• A chlorophyll fluorescence (CF) imaging unit for dark-adapted photosystem II (PSII) efficiency measurements.
• A red-green-blue (RGB) imaging unit, with top-view and multiple side view options.
• A 3D laser triangulation scanning unit for 3D reconstruction images.

This device is an easy-to-use tool to find out what digital phenotyping has to offer. The main purpose of the Robin PSI is to perform small-scale feasibility tests, in order to prepare for future, larger research projects. In the coming years many more phenotyping devices will be installed as part of NPEC, in which similar and other imaging technologies will be integrated on a larger scale, with higher throughput and additional sensors.

Technical Details

Depending on which sensors you use and the size of the plants, a measurement will take a few to several minutes per plant. If you want to use the CF unit, you will need to take into account that a dark adaptation period is needed, which takes five to max twenty minutes per plant.

Impression of measurement images

Applications

One of the research topics suitable for this technology is to study the influence of environment (E) on the phenotype (P) of the genotypes (G) that are tested (P = G + E), and for small plants, GxE can be investigated, if plants are exposed to different (a)biotic environmental conditions (e.g., salt, drought, heat or pathogen/herbivore stresses).
The Robin PSI is able to collect the following physiological and morphological data: max PSII efficiency, biomass, volume, project leaf area per individual leaf, main stem length, plant height, number of leaves, internode lengths, colour, etc. Upon capturing the images, it stores the raw data (segmented and 3D point cloud), and all CF and RGB images, for further analysis by other tools.

Publications

Video NPEC Quinoa breeding, , , https://youtu.be/kqHWeGZIKRY

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Exploring plasmotypic variation in Arabidopsis thaliana, Delfi Dorussen (MSc Thesis), , https://www.npec.nl/wp-content/uploads/2023/04/MSc-Thesis-Report-Delfi-Dorussen.pdf

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Unravelling nuclear natural variation under fluctuating light conditions reveals the complexity of photosynthesis, Sanne Put (MSc Thesis), , https://www.npec.nl/wp-content/uploads/2023/04/MSc-Thesis-Sanne-Put.pdf

Preliminary exploration of the NPQ phenotype of the Ely nucleotype, Louise Logie (MSc Thesis), , https://edepot.wur.nl/525479

Exploring the genetics and physiology underlying the non-photochemical quenching phenotype of the Ely nucleus, Justine Drouault (MSc Thesis), , https://edepot.wur.nl/526818

Revealing cyto-nuclear interactions through phenotypic variation: a study on cybrids of outdoor grown Arabidopsis thaliana, Aaron Lawson, M.Sc. (MSc Thesis), , https://edepot.wur.nl/526832

Zooming in on plasmotypic variation of Arabidopsis thaliana, Dillian Tijink (MSc Thesis), , https://edepot.wur.nl/547337

NPEC virtual tour, , , https://www.npec.nl/virtual-tour/