



PLANT SCIENCES

HIGH-THROUGHPUT PHENOTYPING OF PLANTS

The traditional bottleneck in plant-breeding programs is accurate phenotyping with dedicated data analysis. Capitalising on recent advances in computer vision, robotics and sensor technology, modern phenotyping systems monitor an increasingly complex array of traits non-invasively and in a high-throughput manner. Through our Plant Sciences Facility, researchers have access to state-of-the-art phenotyping of plants grown within accurately controlled environments.

Growing plants indoors provides accurate control of dynamic conditions. High-tech phytotrons support a broad range of abiotic stress conditions, dynamic environmental simulations and high-throughput plant phenotyping. Subsequent image- and data analysis is performed by applying modern tools of deep learning and is powered by the VBC high-performance computing cluster [CLIP].

The dedicated solutions of the Plant Sciences Facility meet the ambitious demands not only of academic researchers concentrating on their work horse *Arabidopsis*. The most recent addition to the plant phenotyping infrastructure is PHENOPlant (funded through FFG). Here, thousands of plants are growing in highly controlled environments on conveyor belts under state-of-the-art LED illumination. The following phenotyping process is fully automated, non-invasive and high-throughput: the plants are moving through numerous imaging boxes equipped with high-tech sensors, and a weighing and watering station allowing for highly controlled stress experiments.

Therefore, also commercial plant breeders can use our services to investigate crops under controlled conditions and how they are performing under intensifying droughts, frost, elevated salinity and pests. This is increasingly relevant for projected decreases in crop yields due to climate change. The Plant Sciences Facility can accurately simulate conditions predicted by climate models and analyse crop plants with state-of-the-art phenotyping technologies. Already now, our facility contributes to future food security in a changing climate through the EU-funded project EMPHASIS.

The facility is continuously developing new ideas how technical solutions in controlling conditions and monitoring plants will advance experimental capabilities. Therefore, the Plant Sciences facility provides a unique service in Austria with a growing repertoire of state-of-the art technologies, which are purpose designed and built. The combined expertise of the highly skilled team contributes to the national and international innovation process in plant sciences.

VBCF PLANTS TEAM



SERVICES AND METHODOLOGIES

- Environmental simulation across climate zones and various abiotic stress conditions (e.g. frost, heat, drought, salinity, pests, high light, CO₂ level)
- Multi-sensor, high-throughput plant phenotyping of *Arabidopsis* and crop plants
- Root phenotyping
- High-throughput image analysis
- Mechatronics and Software development

EQUIPMENT

- **Phytotrons** (walk-in, highly specialized plant growth chambers for environmental simulations)
- **PHENOPlant** (non-invasive, morphometric and physiological high-throughput phenotyping of mid-size crop plants and *Arabidopsis*)
- **PHENOTron** (Robotic, top-view, sensor-to-plant phenotyping system)
- **PHENOBox** (RGB imaging box for plants and agar-plates)
- **PHENOScan** (Agar-plate based screening of *Arabidopsis* roots)



State-of-the-art phytotrons



High-throughput plant phenotyping - PHENOPlant



Mechatronics and Software Development

CONTACT

Plant Sciences

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