



PLANT SCIENCES

WHAT WE DO

Research in plants has led to many ground-breaking discoveries about the molecular mechanisms of life. The mission of the Plant Sciences Facility (PlantS) is to help plant researchers find answers to complex questions by providing services in the field of environmental simulation and high-throughput plant phenotyping.

Simulating Swedish spring in Vienna's summertime

For the investigation of the genotypic and phenotypic variation of natural *Arabidopsis* accessions under different natural settings, real Swedish springtime environmental data has been collected transcribed and transferred to one of our phytotrons. That way we can precisely recreate the four seasons of Sweden in Austria at any time of the year. Besides temperature and humidity values, spectral light conditions were also adjusted to imitate a red sunrise and sunset.

Furthermore, the experiment were conducted in the high-throughput plant phenotyping chamber, where images of each individual plant have been recorded in an automated manner. Image and data analysis have revealed the morphological characteristics of each genotype accession over time. This experiment greatly demonstrates the focus and the capabilities of the VBCF Plant Sciences facility.

Propagating *Marchantia* under different spectral conditions

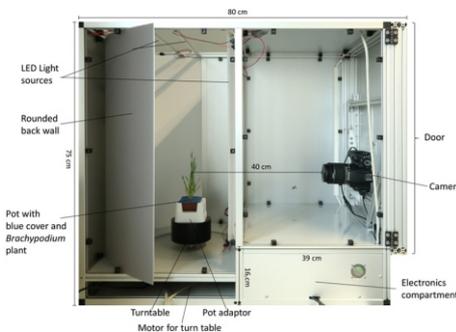
In *Marchantia*, the production of reproductive tissue is dependent on numerous environmental conditions such as day length, humidity, light intensity and most of all spectral light conditions. One of our phytotrons has been recently upgraded with state-of-the-art LEDs providing full control over the light spectrum. The light applied on the left side of the phytotron has been optimized towards a sun-light like spectrum which facilitates biomass production. Plants are then moved to the right-side shelves, where an optimized far-red dominant light spectrum is applied to stimulate the production of reproductive tissue. This highly flexible and unique LED setup contributes to the facilitation of the *Marchantia* research at the VBC.



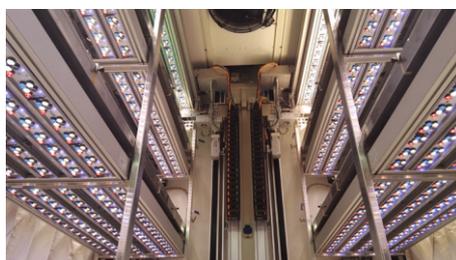
Phenotyping platform PHENOTron



HT image analysis of *Arabidopsis*



PHENOBox for phenotyping of crop plants



Adjustable LED illumination

SERVICES AND METHODOLOGIES

With 22 high-quality, state-of-the-art and highly specialized plant growth chambers, PlantS can precisely control environmental conditions, reproducing abiotic plant stress conditions such as frost, drought and various spectral light and CO₂ gas conditions. Furthermore, we can accurately simulate various global environmental conditions from a range of different climate zones.

The second focal point of PlantS is the automated plant phenotyping which enables highly reproducible and high-throughput assessment of plant phenotypic traits. The phenotyping platform is designed for top-view RGB imaging of small plants like *Arabidopsis* and is fully integrated into one of our high-tech phytotrons.

The image analysis software is also used for custom analysis of e.g. agar-plate based screening of seedlings, plant roots, the side-view phenotyping of large plants and for analysis of microscopically derived images.

EQUIPMENT

22 specialized state-of-the-art walk-in phytotrons:

- Temperature range from -15°C to +50°C
- Adjustable light spectrum & intensity (LED)
- Fully automated watering system
- Adjustable gas atmosphere composition (CO₂)
- Air-Lock System equipped chamber for professional pathogen research
- Abiotic stress conditions: cold-, heat-, drought-, water- and light-stress
- Different global environmental simulations
- High-throughput plant phenotyping platform (PHENOTron)
- Semi-automated RGB phenotyping of crop plants (PHENOBox)
- LemnaTec OS image analysis software for e.g. root phenotyping
- Upcoming in 2021: HT multi-sensor plant phenotyping platform (PHENOPlant) for *Arabidopsis* and crop plants

CONTACT AND LOCATION

Plant Sciences

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<https://www.viennabiocenter.org/facilities/plant-sciences/>

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