

PHenOSPEx

Smart Plant Analysis

Phenospex has developed the PlantEye technology to automate and digitize the phenotyping process from taking plant measurements to obtaining plant parameters to sharing data enabling our clients to deliver new agrochemicals, seeds and crops faster and more efficient than ever before.

Phenospex' PlantEye is a unique plant sensor combining the strength of **3D vision** with the power of **multispectral imaging**. It captures plants non-destructively and delivers 20+ precise and objective plant parameters readily available in real time after each scan.

The software HortControl enables experiment setup in which metadata such as genotypes and treatments are stored along with the parameters. This data can then be easily aggregated and visualized based on the metadata. The aggregated data can be downloaded and shared, facilitating collaboration and data sharing.

PlantEye is integrated in phenotyping products like FieldScan, TraitFinder and MicroScan for automated data collection. The data is ready to be exported and shared. All products are able to run multiple experiments simultaneously.

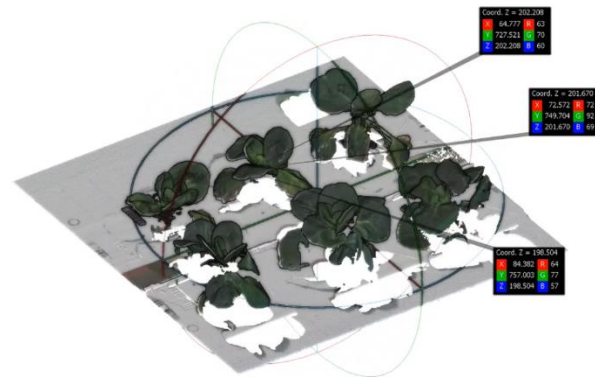
Applications

Phenospex' technology has a wide range of applications. Our tools are primarily used by clients for plant phenotyping applications such as:

- Screening plants for abiotic and biotic stress resilience
- Genotype screening
- Nutrient and water use efficiency screening
- Disease screening and quantification
- Herbicide screening
- Biostimulant / Ag product screenings
- Germination assays
- AI modeling

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Sensor: PlantEye F600

- **Non-Invasive plant screening** – No harvesting or moving of plants
- **20+ Plant parameters in real time after each scan** – Morphological & Spectral plant parameters
- **All environments: growth chamber, greenhouse, field** – Scan in direct sunlight, rain & rough conditions
- **Precise & Objective** – Reproducible plant data
- **High throughput** – Scan thousands of plants multiple times a day
- **Reduce costs** – automate plant assessment

20+ Plant parameters in near real-time after each scan

- Plant Height Max
- Plant Height Average
- Canopy Light Penetration Depth
- 3D Leaf Area
- Projected Leaf Area
- Digital Biomass
- Convex Hull Area
- Convex Hull Area Coverage
- Convex Hull Circumference
- Convex Hull Maximum Width
- Convex Hull Aspect Ratio
- Voxel Volume Total
- Surface Angle Average
- HUE average (Color)
- Lightness average
- Saturation average

RGB & NIR Wavelengths are combined into **spectral indices**. Presently, we provide the most important indices like:

- Normalized Digital Vegetation Index (NDVI)
- Normalized Pigments Chlorophyll ratio index (NPCl)
- Plant Senescence Reflectance Index (PSRI)
- Green Leaf Index (GLI)

Software: HortControl

HortControl is the central software to setup your experiments and to store and manage your data locally on your site. Within seconds after the scan, the plant parameters sets can be visualized and analyzed with the HortControl tool box.

- Set up and control experiments
- Visualize, aggregate and export data
- Automated reports e.g. germination report or growth report

HortControl is highly user friendly and designed to be used by staff with any professional background. You can access HortControl from your office or in the field.



Growth dynamics of tomato plants (height in mm) visualized over time. The high scan intervals reveal leaf movements over the day showing the benefit of high quality and throughput in digital plant phenotyping.

API to extract data to automate plant, experiment & 3D data transfer

- from HortControl into any workflow
- into third party tools & software
- Interoperability between Phenospex data and other sources

BrAPI

- MIAPPE data standards
- Link data to genotype databases

References

Blog Posts

BioConsortia has a biostimulant R&D pipeline that competes with the giants

BioConsortia Inc. develops microbial based plant growth promoting products read all about their very own, patented Advanced Microbial Selection (AMS) pipeline. [Read more](#)

Field Phenotyping for vegetable growth under high heat and flood stress

In 2019 the World Vegetable Center in Tainan tested the growth of vegetables under high heat and flooding stress. [Read more](#)

Digital Disease Quantification in plants, a tailored method

It is more important than ever to easily quantify disease rapidly and effectively. Look at our blog regarding the approach one of our clients took. [Read more](#)

APPF creates a digital phenotype library to build machine Learning algorithms for plant stress identification

At the ANU node of the APPF, we acquired a Phenospex PlantEye DualScan F500 in November 2019 which was installed into one of our Photon System Instruments Growth Capsules, shipping containers which serve as high-precision controlled environments for plant growth. [Read more](#)

Modeling custom plant traits with HortControl at Bioversity International

With more than 1,500 different types of edible and wild species of banana, Bioversity International is home to the world's largest collection of banana germplasm. The organization aims to contribute to the secure long-term conservation of the entire banana gene pool while also conducting research to increase the diversity of cultivars within the banana industry. [Read more](#)

BrAPI, Automate data transfer into your workflow

With the release of HortControl 3.8 we implemented an API allowing you to automate data transfer from HortControl (our data management software) to your workflow. [Read more](#)

PhenoHack: 3D Root scanning with the PlantEye

Semi-automated root analysis can provide additional value for PlantEye customers. [Read more](#)

Selected Publications

Bazhenov, M., Litvinov, D., Karlov, G., Divashuk, M., 2023: Evaluation of phosphate rock as the only source of phosphorus for the growth of tall and semi-dwarf durum wheat and rye plants using digital phenotyping. *PeerJ* 11:e15972. [TraitFinder - https://peerj.com/articles/15972.pdf](https://peerj.com/articles/15972.pdf)

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Boogaard, F.P., van Henten, E.J. and Kootstra, G., 2022: Improved Point Cloud Segmentation for Plant Phenotyping Through Class Dependent Sampling of Training Data to Battle Class Imbalance. *Front. Plant Sci.* 13:838190. [PlantEye - https://www.frontiersin.org/articles/10.3389/fpls.2022.838190/full](https://www.frontiersin.org/articles/10.3389/fpls.2022.838190/full)

Eyland, D., Luchaire, N., Cabrera-Bosquet, L., Parent, B., Janssens, S.B., Swennen, R., Welcker, C., Tardieu, F., Carpentier, S.C., 2022: High-throughput phenotyping reveals differential transpiration behaviour within the banana wild relatives highlighting diversity in drought tolerance. *Plant, Cell & Environment*, 45, 1647–1663. [DroughtSpotter - https://onlinelibrary.wiley.com/doi/10.1111/pce.14310](https://onlinelibrary.wiley.com/doi/10.1111/pce.14310)

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Other references

- ICRISAT India (Youtube video)
 - [Our FieldScan and DroughtSpotter lysimeter](#)
- ICRISAT India (Youtube video)
 - [Dr. Hummel & Dr. Vadez: Combining 3D & Gravimetric data from plants to breed climate smart crops](#)
- The Plant Accelerator, Australia (PDF brochure)
 - <https://www.plantphenomics.org.au/wp-content/uploads/DROUGHT-HEAT-PLATFORM-200-x-287mm-fact-web-sheet-1.pdf>
- Syntech research Spain (Linkedin post)
 - [Post with our TraitFinder](#)
- Phenospex (Youtube Video)
 - [FieldScan Valagro - High Throughput phenotyping for biostimulant research](#)
- Prof. Robert R. Junker, University of Marburg (Youtube, IPPN Webinar)
 - [Digital phenotyping of individual plants and plant communities in the field](#)
- University of Turin (Website)
 - [Plant phenotyping platform](#)
- Justus-Liebig-Universität Gießen (Youtube video)
 - [Anna Langstroff - High-Resolution Phenotyping of Drought Tolerance Traits in Wheat](#)

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