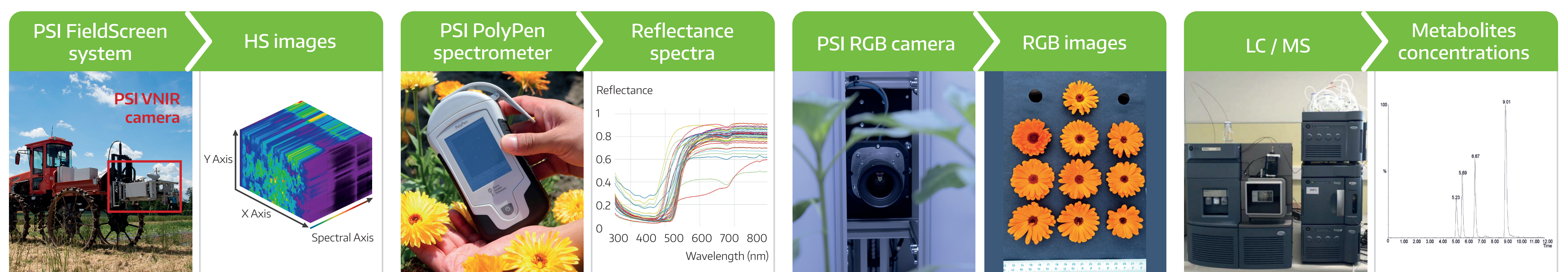


Experimental setup

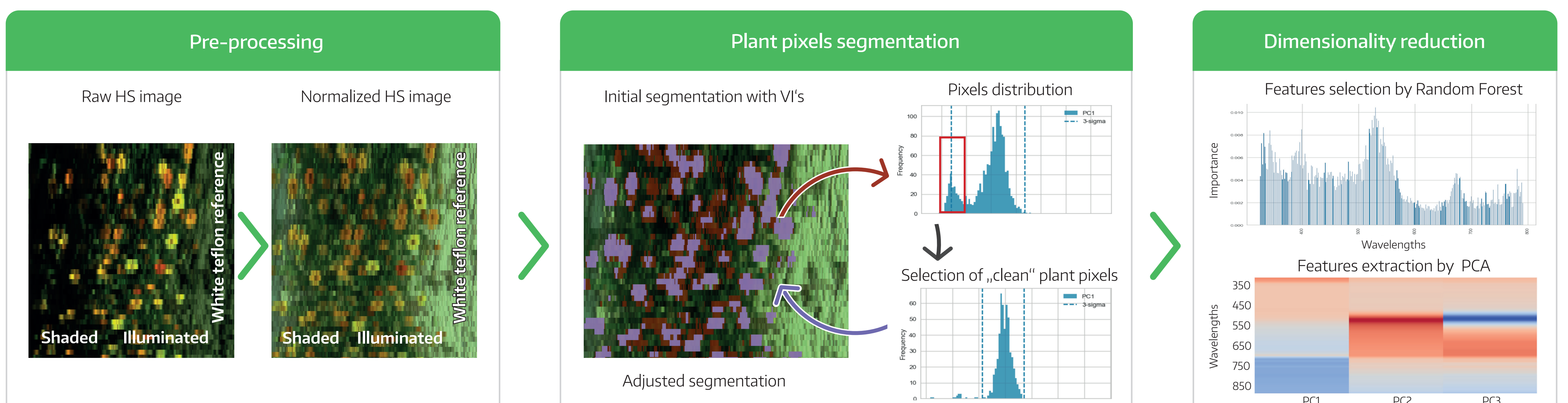
Hyperspectral imaging (HSI) is a cornerstone of non-destructive plant phenotyping. With the growing interest in field phenotyping systems, Photon System Instruments (PSI) has developed the mobile PlantScreen™ Field Phenotyping System, which integrates range of imaging sensors including the HySpec VNIR Camera and PSI RGB camera modules.

In a pilot collaborative project with **CATRIN/UPOL/CRI**, we applied hyperspectral VNIR and RGB field-based imaging to non-destructively characterize the specific metabolite profile in *Calendula* sp. flowers of 8 different cultivars. Here, we present the pipeline for processing hyperspectral and RGB data, including validation based on reflectance spectra from a hand-held PolyPen spectrometer (PSI) and integration with metabolomic data from Liquid Chromatography/Mass Spectrometry (LC/MS).



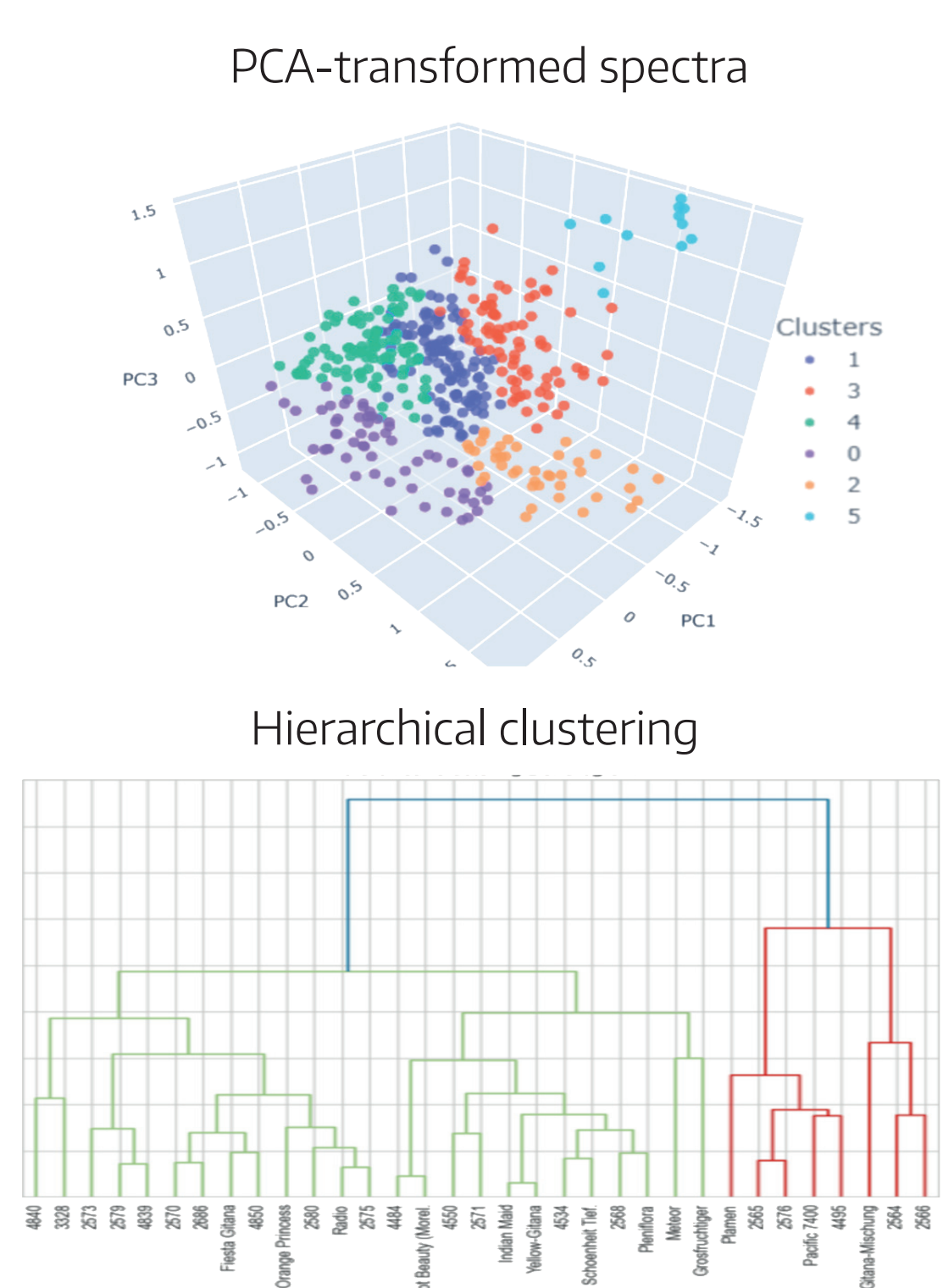
HSI data processing pipeline

HSI data processing pipeline
Data processing includes **1. pre-processing** steps (white calibration and normalization) aimed to compensate for a challenging light conditions of field HSI imaging, **2. plant pixel segmentation** (with consequent unmixing) and **3. dimensionality reduction** to extract most relevant spectral features.



Visualisation

Visualisation
Transformed HS spectra are clustered to visualize the similarities between *Calendula* cultivars.



Final goal

Final goal - pipeline for non-destructive metabolites profiling

Processed data from multiple sensors are loaded into base models for spectral, morphological, and metabolic data. Their predictions form a new training set for a meta regressor model, which predicts the metabolite profile of *Calendula* cultivars using LC/MS data as the ground truth.

