

Recovery, a new dimension to stress research in plants. A case study of the response of the maize leaf growth zone to a cold spell

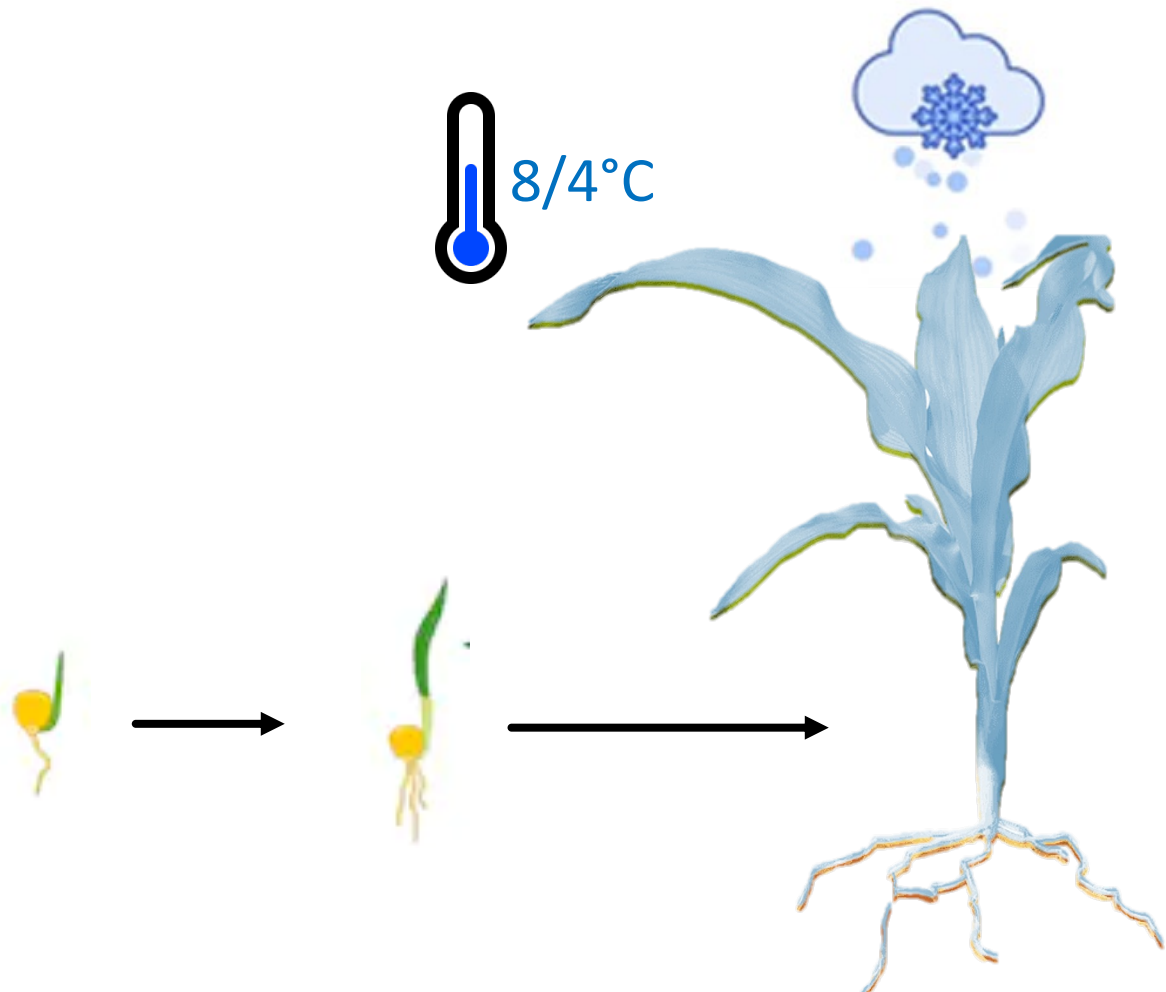
MAIZE,

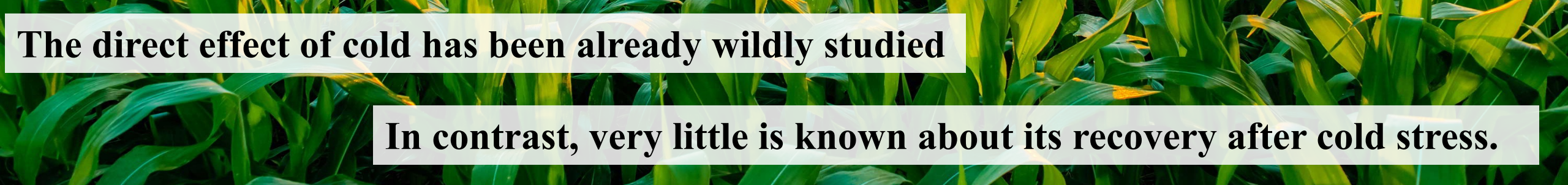
IS THE MOST WIDELY GROWN CROP SPECIES WITH 1.6 TRILLION POUNDS PRODUCED EACH YEAR

BUT!

HAS ITS PRODUCTIVITY HIGHLY LIMITED BY COLD SPELLS IN WESTERN EUROPE

In fact, cold spells occurs every spring, damaging maize plants at an early stage





The direct effect of cold has been already widely studied

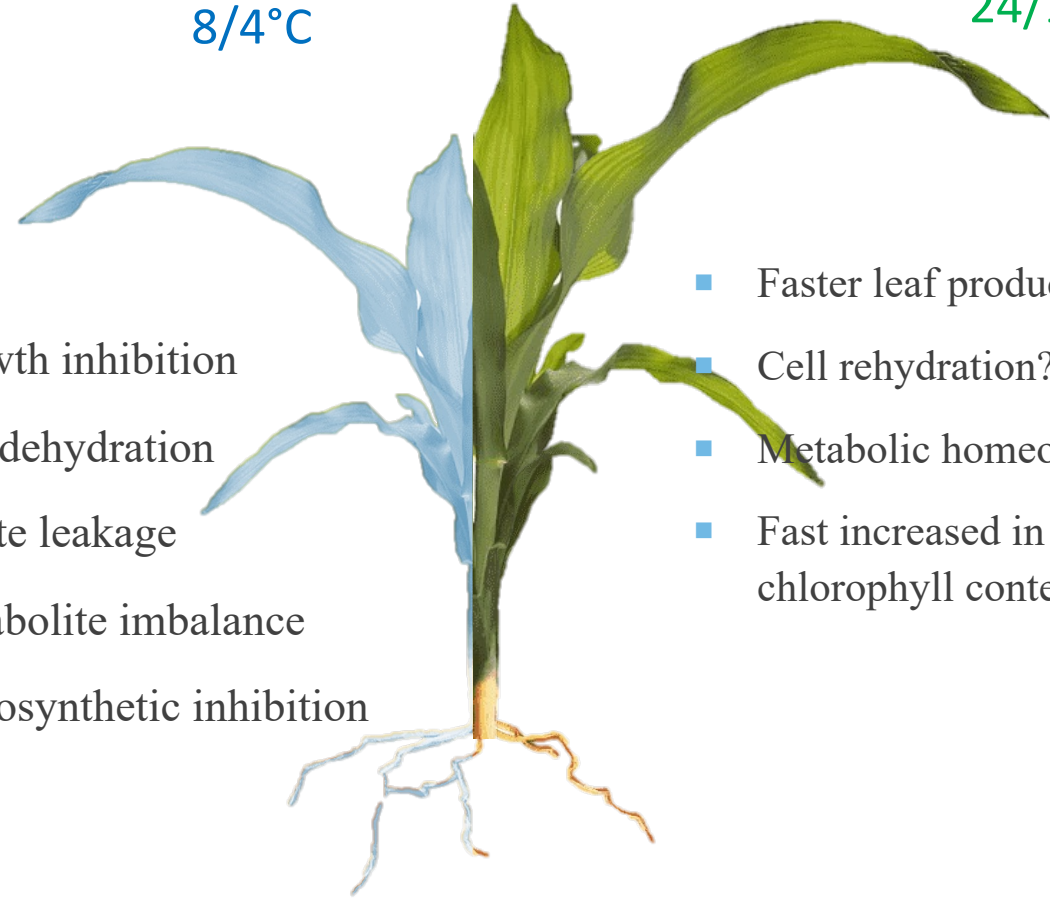
In contrast, very little is known about its recovery after cold stress.

COLD STRESS   
8/4°C

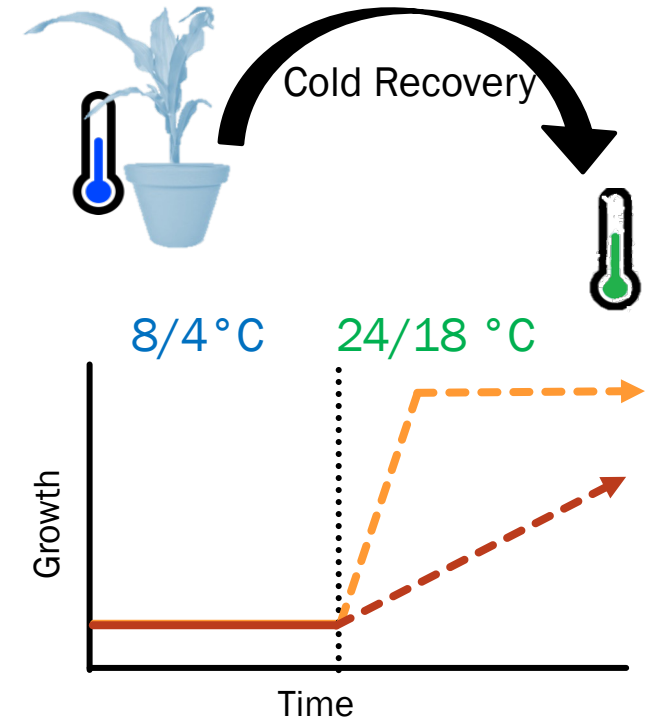
COLD RECOVERY   
24/18°C

GROWTH

- Growth inhibition
- Cell dehydration
- Solute leakage
- Metabolite imbalance
- Photosynthetic inhibition



- Faster leaf production?
- Cell rehydration?
- Metabolic homeostasis?
- Fast increased in chlorophyll content?

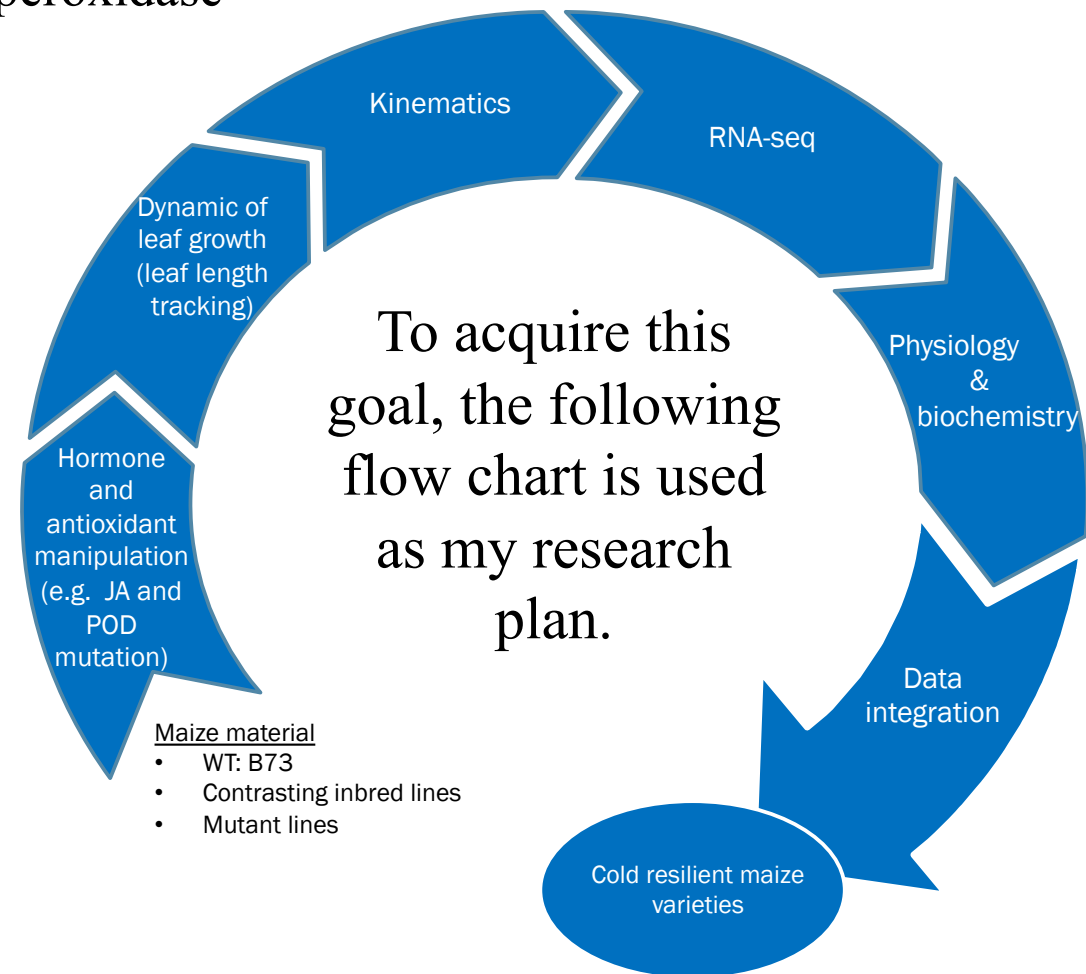


# Scientific research objectives

By a kinematic and genome-wide transcriptome analysis, we identified the phytohormone jasmonic acid (JA) and the enzymatic antioxidant peroxidase (POD) as potential key regulators of recovery from cold.

## THIS RESEARCH, THEREFORE, AIMS

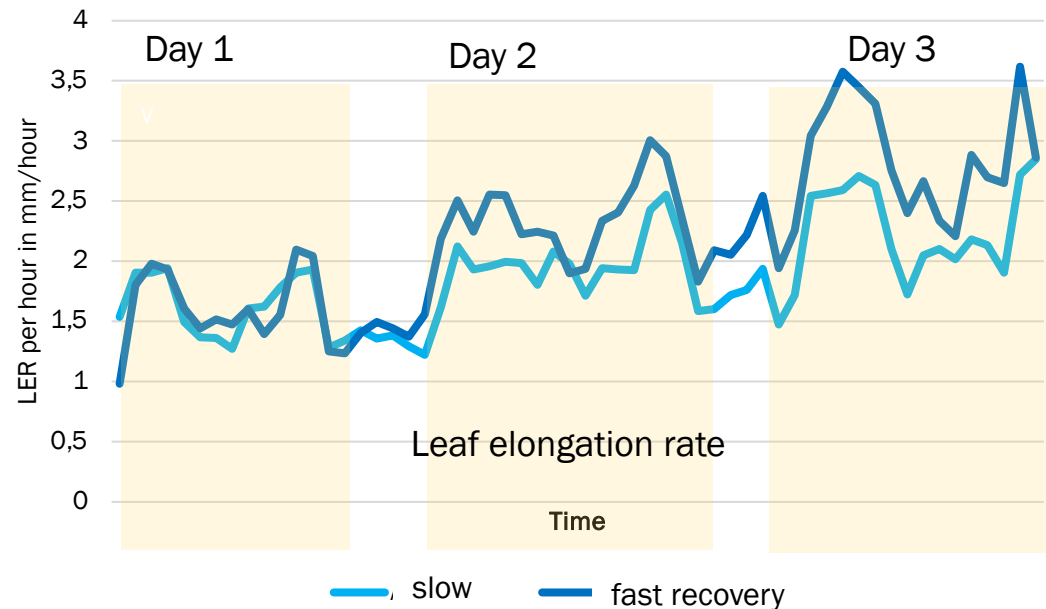
- (1) Pioneer a novel, high-resolution leaf growth analysis using automatic leaf length tracking for studying stress recovery
- (2) Characterize the role of jasmonic acid and peroxidase in cold recovery at the cellular level by kinematic analysis and at the metabolite level by series of biochemical experiments
- (3) Unravel the molecular mechanisms downstream of JA and POD guiding the recovery response by transcriptomic analysis.



At the phenotypic level => To characterize maize mutants either exhibiting lower JA synthesis or POD activity for cold recovery

## Dynamic of leaf growth

- Diurnal maize leaf growth (leaf length tracking)
- Leaf length measurement
- Statistical analysis

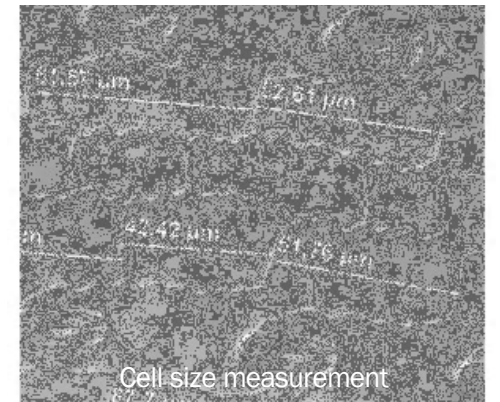
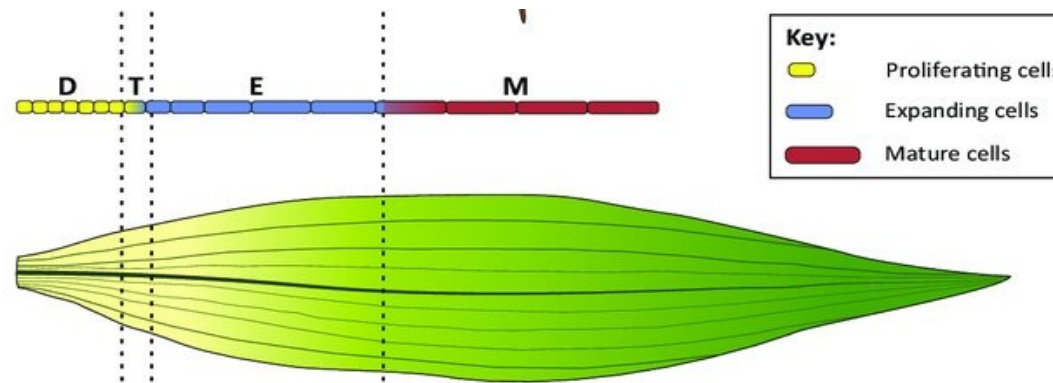
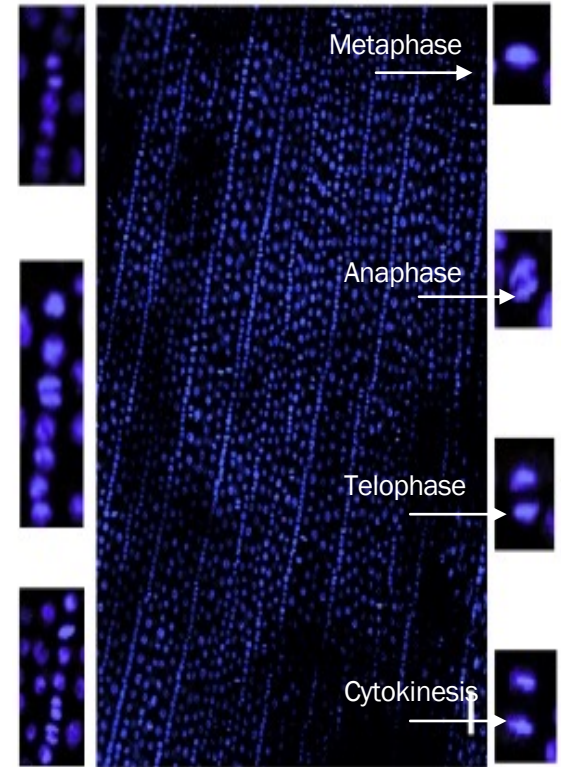


**Leaf Length Tracker**

At the cellular level => To draw the spatial map of leaf growth

# Kinematics analysis

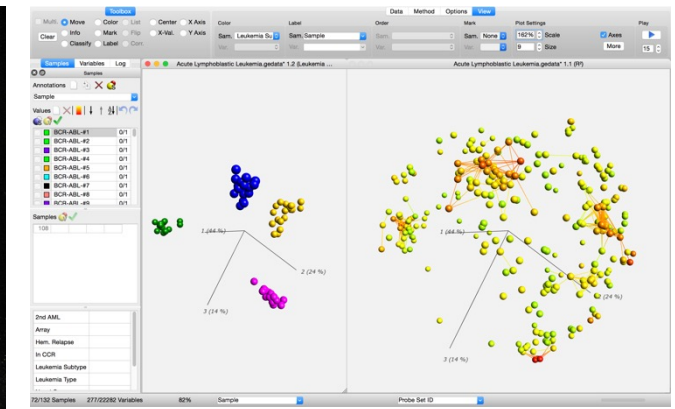
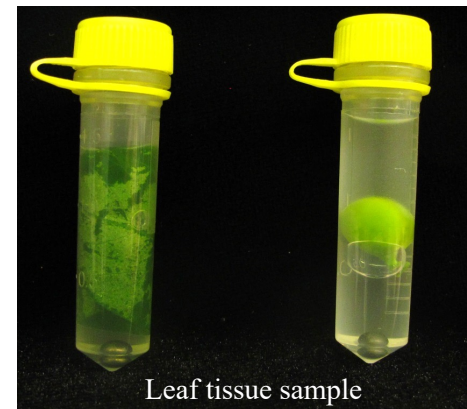
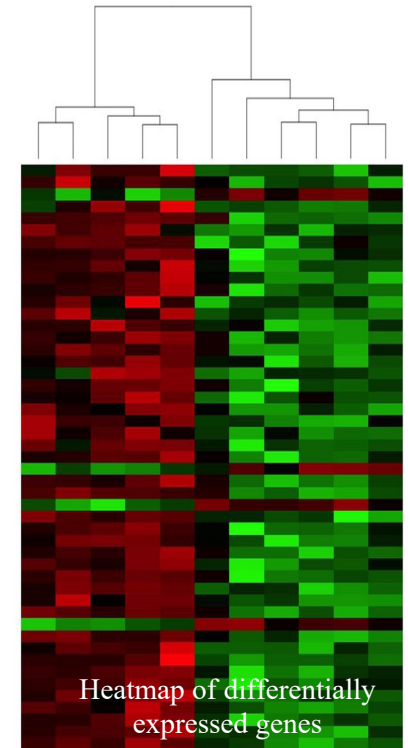
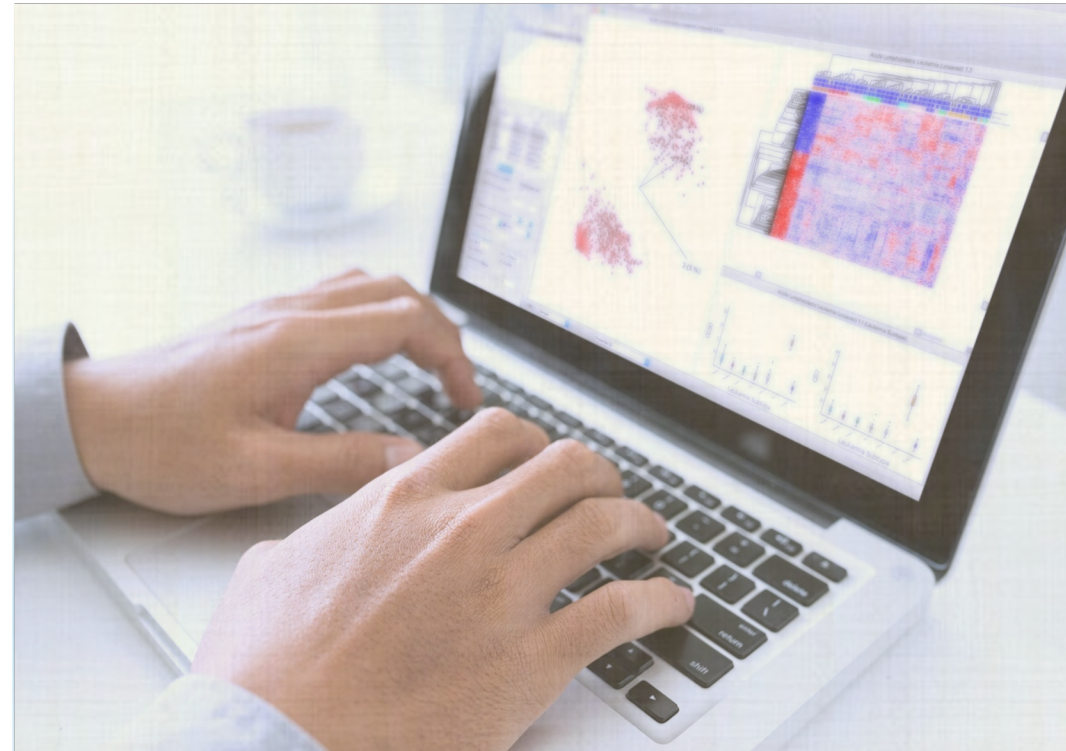
- Microscopy
- Leaf elongation rate
- Cell size
- Meristem size



At the molecular level => Unravel the molecular mechanisms downstream of JA and POD guiding the recovery response by transcriptomic analysis

# Genome wide RNA-seq using Next Generation Sequencing

- RNA extraction
- Bioinformatics data analysis
- Cluster differentially expressed genes
- Gene ontology utilisation
- Pathway analysis

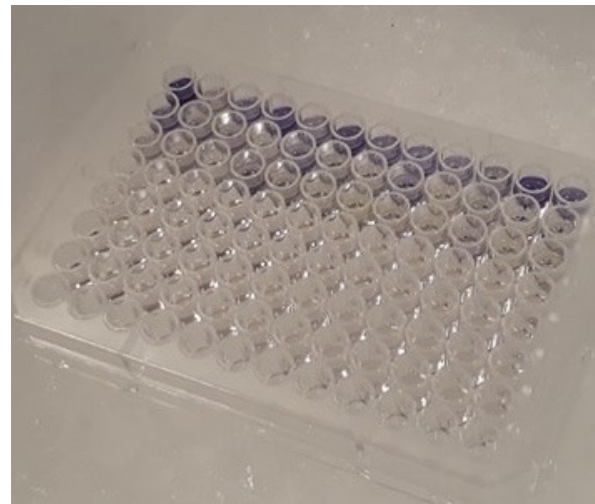


At the biochemical and physiological level => To select pathways associated with cold recovery

# Metabolites analysis & Photosynthesis



- Antioxidant/ROS
- Enzyme activity
- Chlorophyll fluorescence
- Gas exchange





## How to contact us for more information?

Interested or want more  
information?  
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