
Harald Osa
Research and Development manager

# Close to 140 years of history

**1886**

Founded by Christian Matthiessen ("Banan-Matthiessen")

**1905**

Sales of bananas since 1905

**1915**

Family-owned by the Nergaard family from 1915 (now AS Banan)

# This is BAMA

**139**
Years

**1960**
Established F/G

**2260**
Employees in Norge

**955**
Employees internationally

**3,4%**
Profit 2024

**24,2**
BN NOK
Revenue 2024

bama – *A healthier and fresher future*

**Our vision**

## A healthier and fresher future

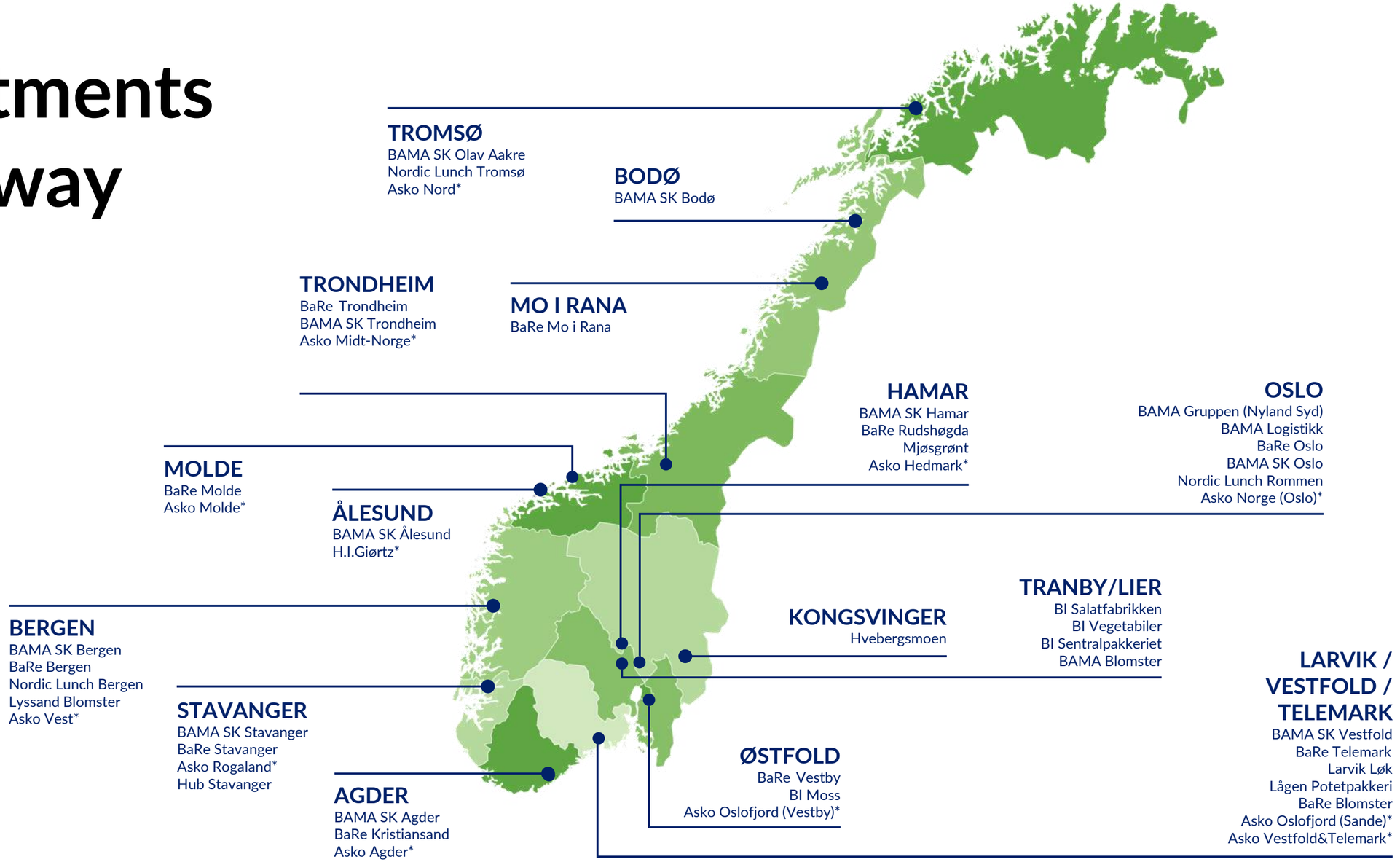
**Our responsibility**

## Stimulate increased consumption of fruits, vegetables, berries and potatoes

**Our promise**

## Offer the most sustainable products

# Departments in Norway



**TROMSØ**
BAMA SK Olav Aakre
Nordic Lunch Tromsø
Asko Nord*

**BODØ**
BAMA SK Bodø

**TRONDHEIM**
BaRe Trondheim
BAMA SK Trondheim
Asko Midt-Norge*

**MO I RANA**
BaRe Mo i Rana

**HAMAR**
BAMA SK Hamar
BaRe Rudshøgda
Mjøsgrønt
Asko Hedmark*

**OSLO**
BAMA Gruppen (Nyland Syd)
BAMA Logistikk
BaRe Oslo
BAMA SK Oslo
Nordic Lunch Rommen
Asko Norge (Oslo)*

**MOLDE**
BaRe Molde
Asko Molde*

**ÅLESUND**
BAMA SK Ålesund
H.I.Giørtz*

**BERGEN**
BAMA SK Bergen
BaRe Bergen
Nordic Lunch Bergen
Lyssand Blomster
Asko Vest*

**KONGSVINGER**
Hvebergsmoen

**TRANBY/LIER**
BI Salatfabrikken
BI Vegetabiler
BI Sentralpakkeriet
BAMA Blomster

**STAVANGER**
BAMA SK Stavanger
BaRe Stavanger
Asko Rogaland*
Hub Stavanger

**ØSTFOLD**
BaRe Vestby
BI Moss
Asko Oslofjord (Vestby)*

**AGDER**
BAMA SK Agder
BaRe Kristiansand
Asko Agder*

**LARVIK / VESTFOLD / TELEMARK**
BAMA SK Vestfold
BaRe Telemark
Larvik Løk
Lågen Potetpakkeri
BaRe Blomster
Asko Oslofjord (Sande)*
Asko Vestfold&Telemark*



*BAMA Dagligvare's operating departments were transferred to ASKO in 2022/2023

# From field to fork

*Producers and suppliers*

**37%**
Norwegian production

Total
**500,000** tons

**63%**
International production

Packing plants

Direct to terminals

Industrial processing

*BAMA's own operations*

**Terminals**
in 15 Norwegian cities

About **5200**
Daily deliveries in Norway

*Customers and consumers*

Grocery

Food service

Service market

bama – *A healthier and fresher future*


# Areas of business

## Grocery

Serves two of the largest grocery groups in the market. Organized and operated through two companies and completely separate structures. Completely disconnected from each other and fully differentiated models.

## Flowers

Delivers flowers to all business areas and to specialist traders. Sales to customers are operated through separate systems.

## International

Includes companies in the Netherlands and Poland. The companies have strong positions in their own markets and create synergies in product development.

## Food Service

Markets and distributes fruit and vegetables as well as products such as seafood, chicken and game to customers in hotels, restaurants and restaurants, canteens, catering, public sector and offshore.

## Industry

Includes companies in Norway, Sweden and Finland that develop and produce freshly processed products adapted to BAMA's business areas. The company refines salads, potatoes, fruits and vegetables.

## Sourcing

Ensures that fresh products are always supplied in the right quantity and with the right quality from home and abroad, through terminals and packing plants. Norway is a small buyer in a global context, but we are a major player with the selected suppliers. This ensures competitiveness.

# BAMA's largest international companies


Nature’s Management owns two companies: Nature's Pride and Berries Pride. The companies offer a wide range of exotic fruits, berries, and vegetables, delivered directly from skilled farmers around the world. The assortment includes everything from ready-to-eat fruit to unique exotic vegetables, berries and spices.

Headquarters: **Netherlands**


Global supplier of flowers, specialized in flowers packaged and ready for sale, founded in 2010.

Headquarters: **Netherlands**


Fresh, ready-cut and smart, green meal solutions. Fresh and frozen products that can be eaten on the go, such as sandwiches, baguettes, wraps, salads, sushi and sauces.

Headquarters: **Sweden**

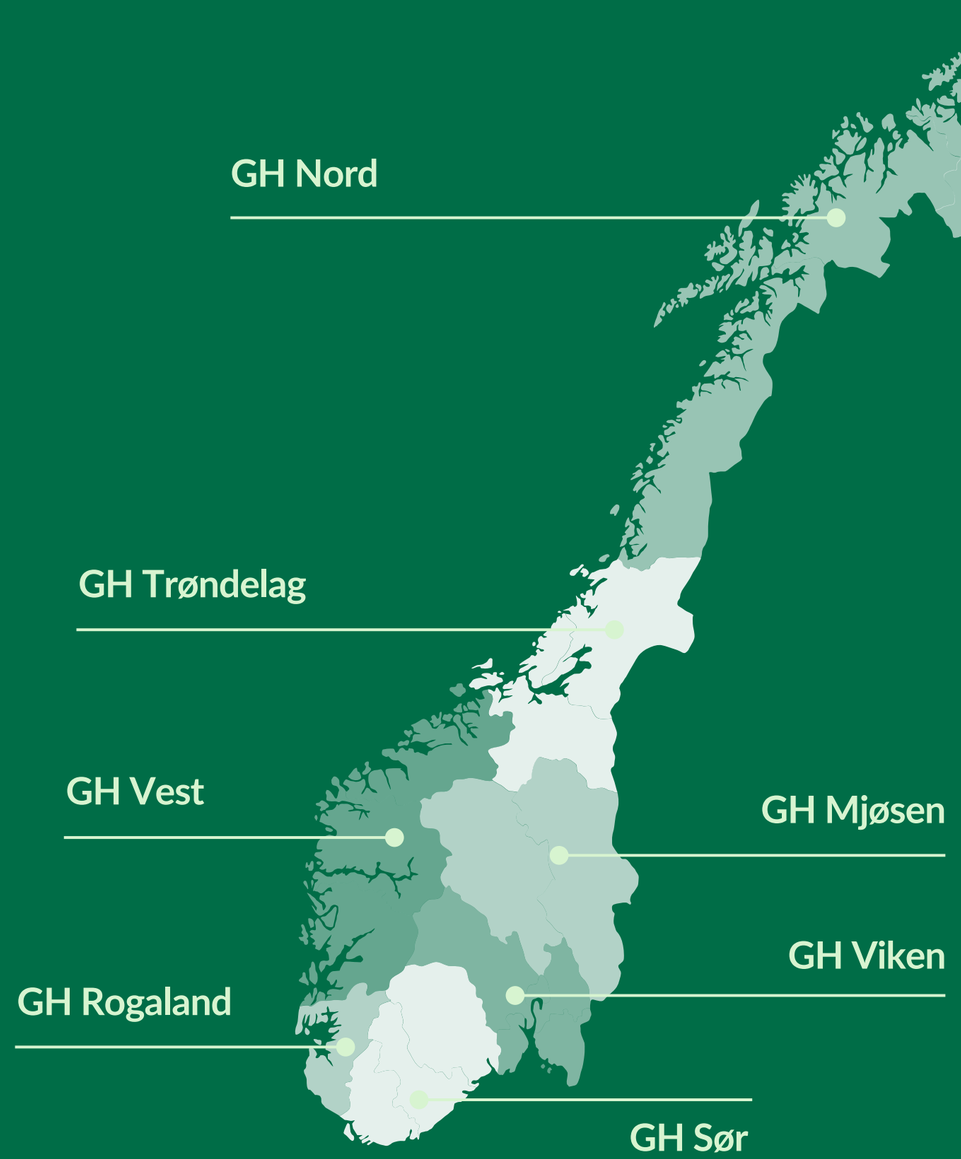
# Gartnerhallen

## Our most important partner

**1000**
Producers

**7**
Regions

- Ensures fruit and vegetable production throughout the country. This gives consumers the opportunity to buy as local food as possible.
- Annual plan per producer is a prerequisite.




bama – *A healthier and fresher future*


# The fruit and vegetables expert

bama – A healthier and fresher future

Our new reality

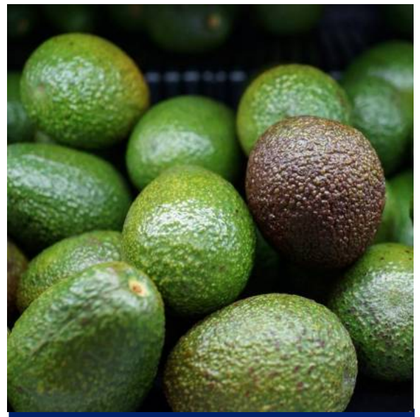
# Facing climate change and global challenges

## Wilder, wetter Norwegian climate

Consequences of extreme weather in 2023 led to increased imports in 2024

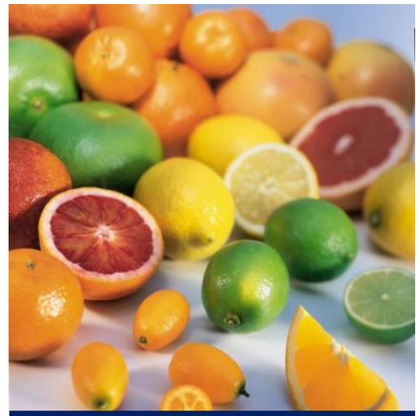
## Global climate change

Drought, heatwaves, and heavy rainfall damage production and affect quality



## Uncertain access to water

Key products like avocados are grown in countries with high water risk



## War and geopolitics

BAMA follows the Norwegian authorities' guidelines for trade

## New challenges in global trade

Seizures of narcotics in banana crates from South America have occurred

# Strategy to increase Norwegian production

# 50% more Norwegian fruit and vegetables in 2030

## BAMA shall be a driving force for healthier diets and increased Norwegian, sustainable green production

- It should be easy, tasty and tempting to follow the dietary advice's recommendation for more fruit and vegetables, and attractive to choose Norwegian products
- It should be attractive, profitable and sustainable to produce the food that Norwegians need and want in the future

## Three main tracks in BAMA's Norwegian strategy

### Innovation, technology and variety development

Products people want to eat more of. Varieties and production for tomorrow's market and climate

*20% of revenue shall come from new products, concepts and varieties*

### Quality and freshness

The advantages of close and safe production – make it worth choosing Norwegian. Strengthens attractiveness and durability.

*Maximum 24 hours from picking, production and packing to the store*

### Increased efficiency and competitiveness

Less wastage. More attractive, long-term and profitable

*3% more efficient from farm to meal and more competitive Norwegian production*



*Compared to 2016

# Urgent need for new varieties

- Taste, texture, and appearence
- Plant protection and resistance
- Agronomy and yield
- Shelf life

LITHUANIAN RESEARCH CENTRE FOR AGRICULTURE AND FORESTRY

# PhenoPlantCC: a new plant phenotyping competence centre in Lithuania

Gintaras Brazauskas
Rita Armonienė

# LAMMC in brief

**172** researchers (**419** employees total)

**67** PhD students

**6** long term research programmes

**58** international and **76** national grants

**154** peer-reviewed publications

**9** new plant varieties registered in 2024

# Research directions

- Biopotential of plants
- Sustainable forestry
- Plant protection
- Smart horticulture
- Soil quality and productivity
- Genetics and plant breeding

# Plant breeding at LAMMC

- Since 1922
- Cereals, grasses, legumes, vegetables, fruits, berries, etc.
- More than 500 cultivars released
- 149 cultivars on a National List
- PhenoPlantCC

# Competence Center for Plant Phenotyping for Healthy Food and Sustainable Agri Biological Resources (PhenoPlantCC)

- Plant Genomic Technologies
- Plant Phenotyping
- AI-backed data analysis
- Plant Adaptability
- Bio-based Feedstock Quality

LITHUANIAN RESEARCH CENTRE FOR AGRICULTURE AND FORESTRY

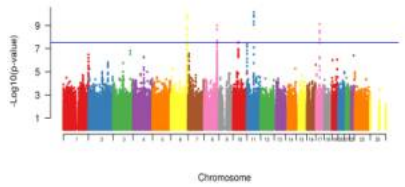
VYTAUTAS MAGNUS UNIVERSITY

UNIVERSITY OF COPENHAGEN

# Phenotyping facilities

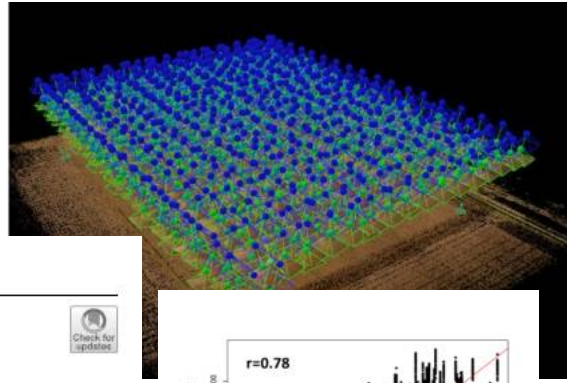
- Field phenotyping
- Phenospex TraitFinder
- Freezing tolerance
- Photobiology chambers
- Metabolite screening

NOBAL wheat





Genome-wide association study reveals 18 QTL for major agronomic traits in a Nordic–Baltic spring wheat germplasm

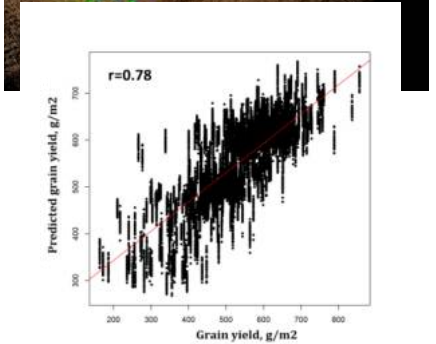


Theoretical and Applied Genetics (2024) 137:25
https://doi.org/10.1007/s00122-023-04529-1

ORIGINAL ARTICLE

Genome-wide association analysis identifies a consistent QTL for powdery mildew resistance on chromosome 3A in Nordic and Baltic spring wheat

Min Lin[1] · Bulat Isla
Ilmar Tamm[2] · Han




GWAS analysis of Fusarium head blight resistance in a Nordic-Baltic spring wheat panel

Shayan Syed[1], Andrius Aleliūnas[2], Rita Armonienė[2], Gintaras Brazauskas[2] and Andrii Gorash[1*]



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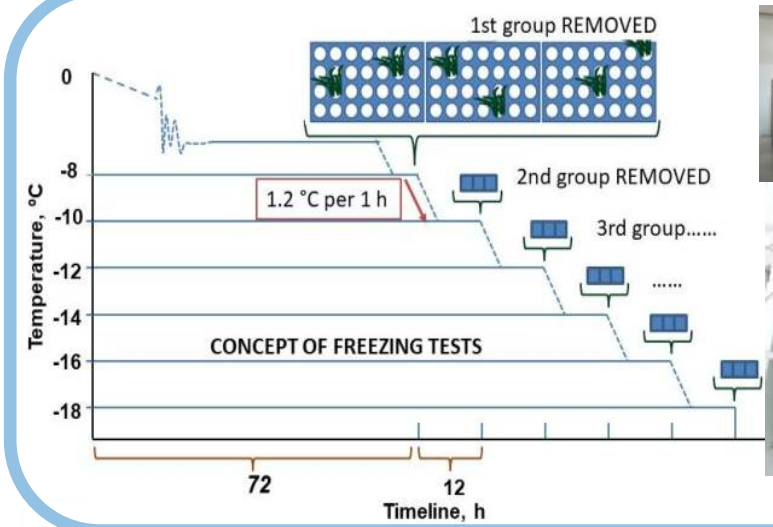
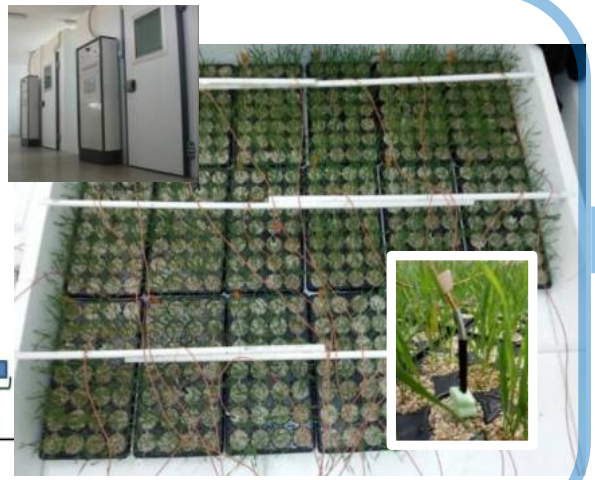
# Freezing tolerance in w. wheat

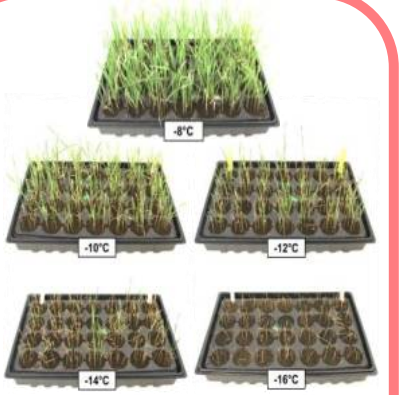
**COLD ACCLIMATION**
(+2 °C, 2-8 weeks)

**FREEZING TEST**



**CALCULATION OF $LT_{50/30}$**




**Regrowing plants are counted**

lethal temperatures, where 50/30 per cent of plants are killed are calculated



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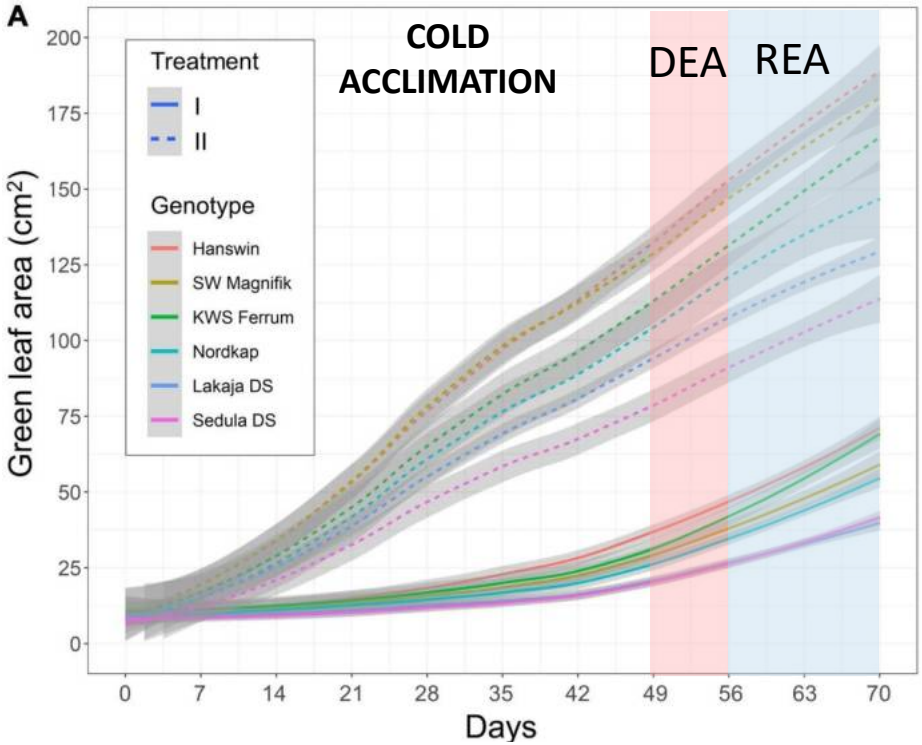
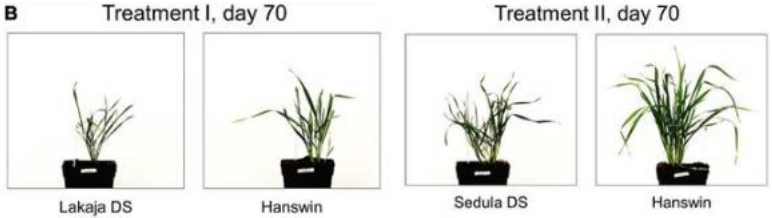
## Prolonged higher low-temperature during CA results in increased shoot biomass accumulation



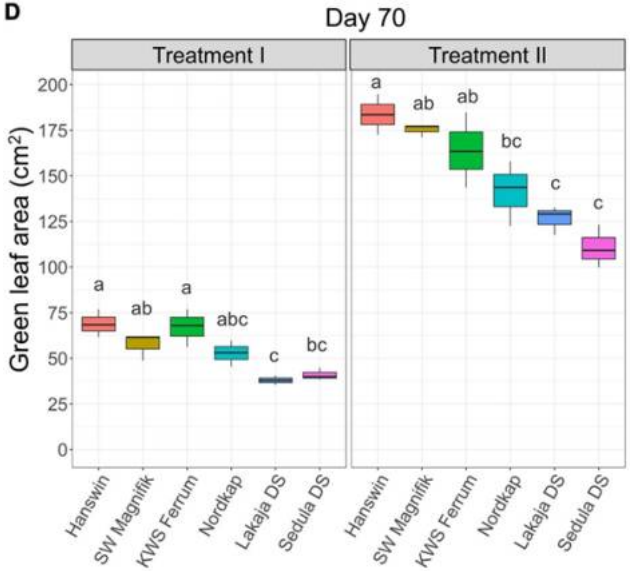




FIG. 1 The dynamics of shoot biomass accumulation of 6 winter wheat genotypes during 49 days of CA, followed by 7 days of DEA and 14 days of REA in two low-temperature treatment groups.

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# Metabolic profiles were affected by prolonged higher low-temperature during CA

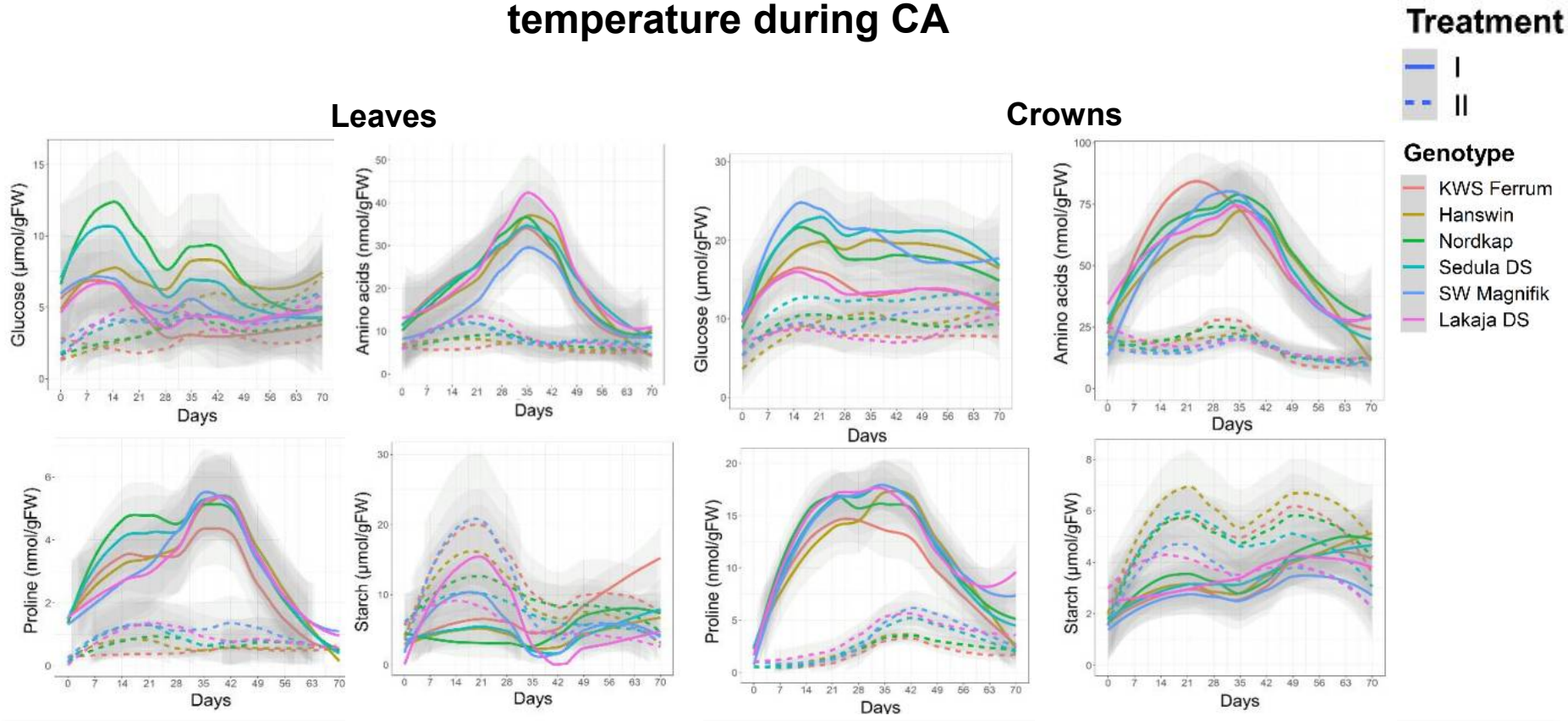



Fig. 3 The effect of different temperature treatments during CA on metabolite accumulation in winter wheat

## DEA

**↑ genes in crowns**

- carbohydrate and glutathione metabolic processes,
- regulation of root development,
- lignin biosynthetic,
- catabolic processes.

**↑ genes in leaves**

- oxidative stress,
- protein phosphorylation,
- DNA transcription.

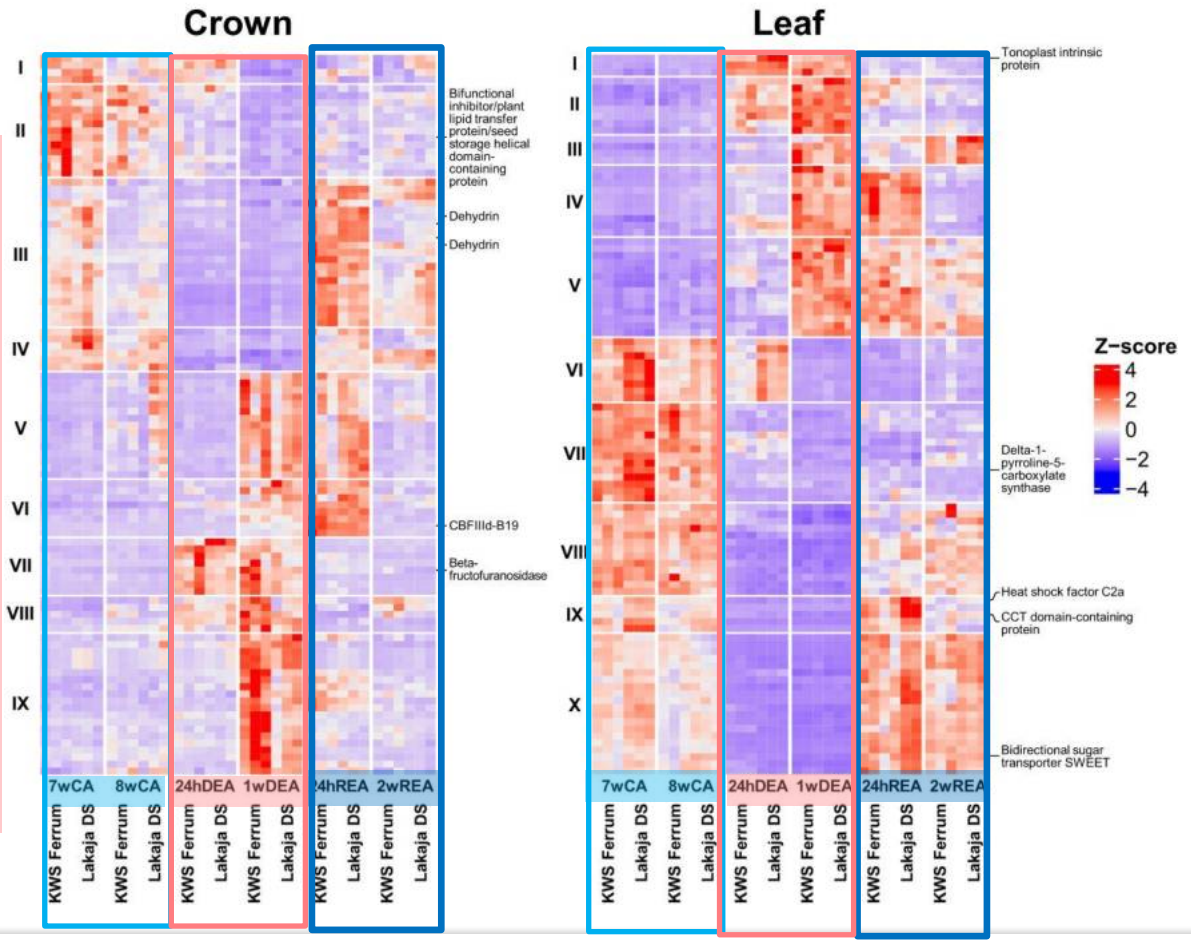
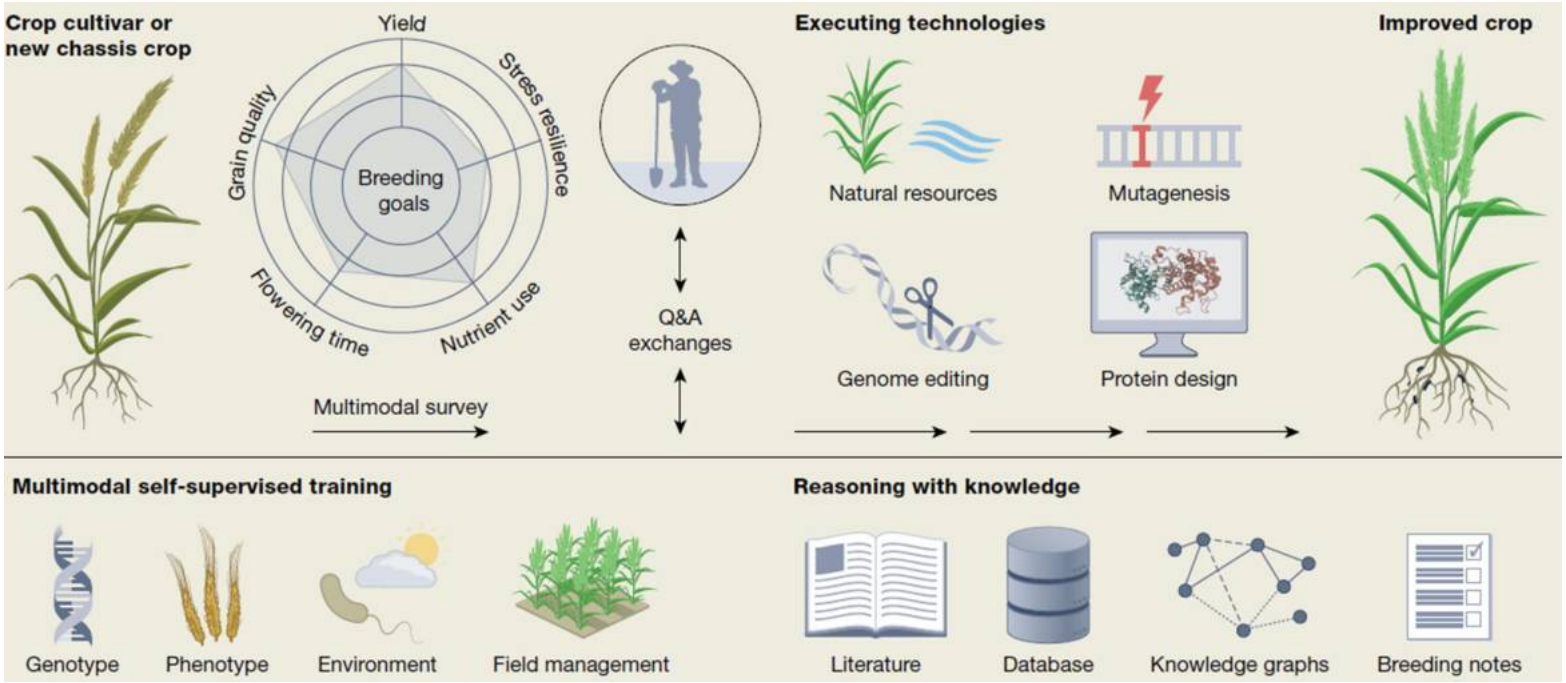



Fig 5. Gene expression throughout cold acclimation (CA), deacclimation (DEA) and reacclimation (REA) in crown (**A**) and leaf (**B**) tissues of two winter wheat genotypes. Depicted are the top 100 most significant genes with the lowest adjusted p-values (padj) and $Log_2$ fold change ± 2.

# Breeding by design




*Li et al., 2025*



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# *Thank you!*

More on LAMMC activities:
**https://lammc.lt**

PheNo- Kick-off Meeting, 13.Nov.2025

# “Meeting needs for plant phenotyping competence through PhD education in Norway”

Kirsten Krause, Leader of the Norwegian Researcher School

Photosyntech

UiT- The Arctic University of Norway

# How can we engrain modern phenotyping in PhD education?

Photosyntech

The Norwegian Graduate School on Photosynthetic Eukaryotes
July 2022 – June 2030

"Photosynthetic Eukaryotes: From Fundamentals to Applications in Biology, Bioproduction and Biotechnology"

The national graduate school

# Photosyntech

Photosyntech connects and unites the scientific community within plant and algae related research across Norway. We stimulate collaboration within the community and with industries. We will also stimulate transferable skills needed after the PhD, and for collaboration with companies.

## Bringing stakeholders in to our PhD education

We offer **courses**, **webinars** with relevant industries, **workshops**, **grants** for traveling to courses and internships, and a **network** with other PhDs, established scientists and companies.

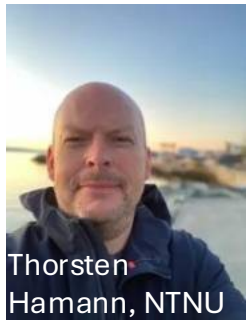
**Funding:**

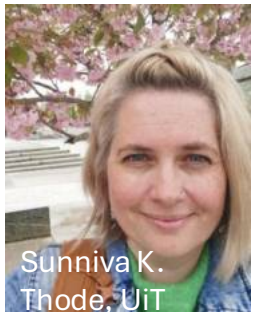
Forskningsrådet

# Who is Photosyntech?

## Leader group:


Kirsten Krause, UiT


Thorsten Hamann, NTNU

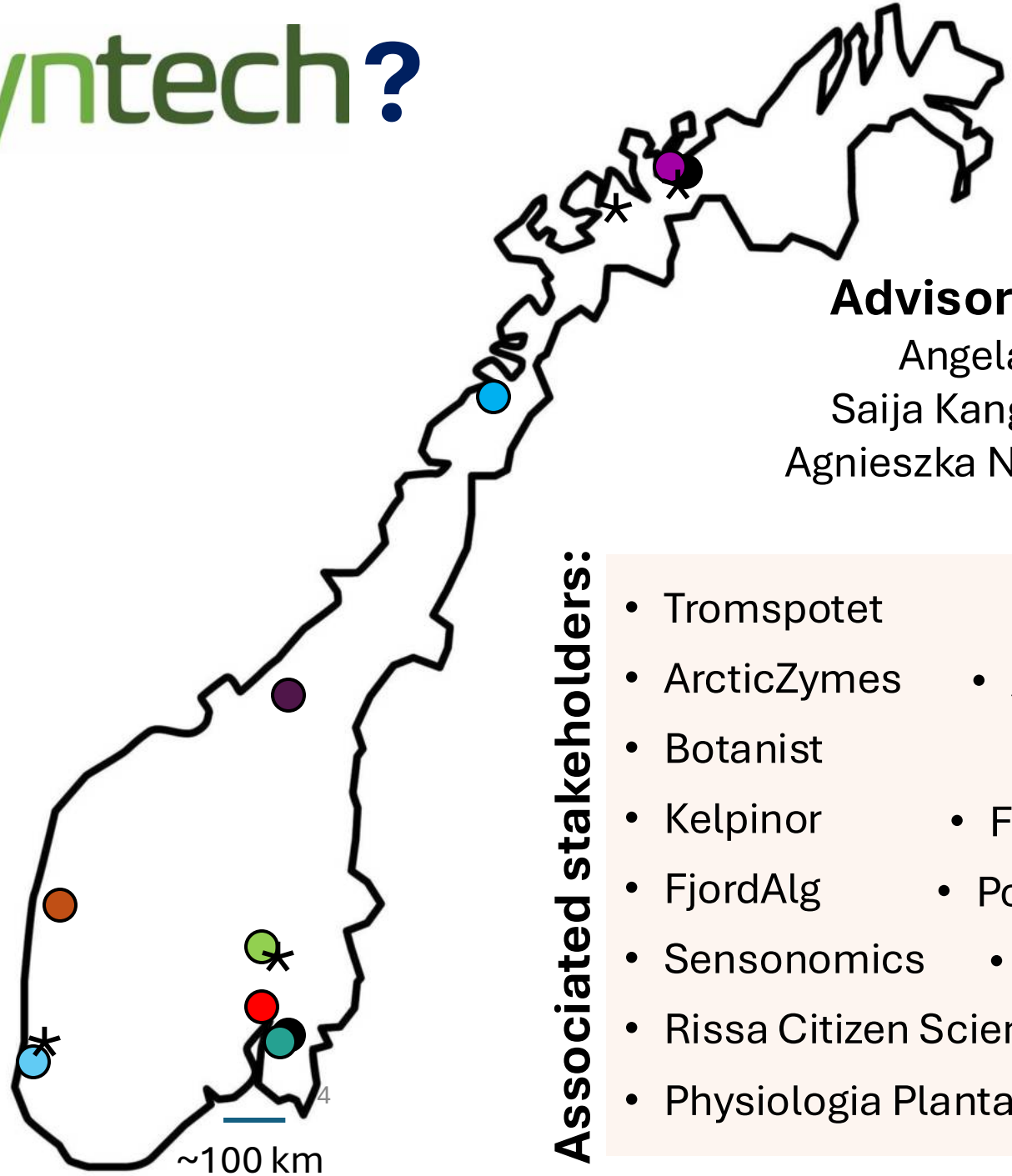

Sunniva K. Thode, UiT

elected PhD student

## Partner institutions and businesses:

UiT · NTNU · NORD · Universitetet i Stavanger · Norges miljø- og biovitenskapelige universitet · UiO · iNN · FINNFJORD · Biotech North · NIBIO Norsk institutt for bioøkonomi · Graminor · TEAL

**Steering Committee**




## Advisory Board:

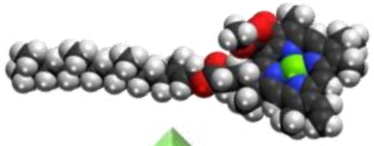
Angela Wulff, SE
Saija Kangasjärvi, FI
Agnieszka Nielsen, DK

## Associated stakeholders:

- Tromspotet
- ArcticZymes
- Botanist
- Kelpinor
- FjordAlg
- Sensonomics
- Rissa Citizen Science
- Physiologia Plantarum
- Art Nor
- Agribiotix
- Bionér
- Folla Alger
- Polar Algae
- Woolero

# Photosyntech's scope

- multidimensional
- multidisciplinary
- worklife-relevant



Application, business

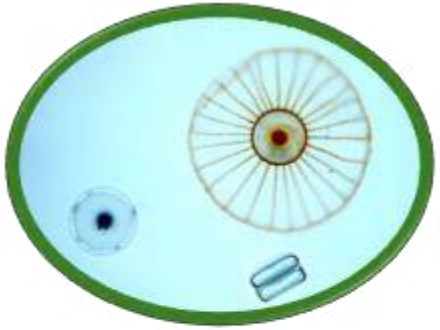
Molecules to ecosystems

industry/agriculture

Academia to

Microalgae

trees



Education, basic research

# Courses

## Biotechnology

- Plant Production Systems and Molecular Farming
- Modern Genetics: Molecular marker mapping, genome editing
- Bioenergy production from photosynthetic organisms

## Bioproduction and properties of photosynthetic eukaryotes

- Bioreactor technology of plants and algae
- Epigenetics for developmental and metabolic regulation
- Photosynthesis (Structure, Function, Development)
- Secondary metabolites and bioactive compounds

## Climate, environment and sustainable resources

- Stress Biology surveillance and design
- Impacts of agriculture on the environment
- Vegetation mapping and field phenotyping
- Biodiversity assessment and species diagnostics

## Transferable skills with working-life relevance

- Circular Economy Business Models
- Innovation Spotlights in Bioeconomy
- Entrepreneurship in Biotechnology
- Legal frameworks for Research and innovation with plant genetic resources

Photosyntech

# Workshops


Kirsten Krause


Erik Alexanderson


Paul Grini

## "Crop field and algae phenotyping" workshop in Oslo, 20 March 2024

NordPlant > Events > "Crop field and algae phenotyping" workshop in Oslo, 20 March 2024

Photosyntech

NordPlant UPSCALE

PLANT Network Norway

SPPS

Photosyntech


# PhD-organized conferences and workshops

# Industry interactions


→ Led to 3 of our PhD students getting job offers with associated stakeholder companies even before being finished

→ Resulted in new research collaborations and Master projects

# Outreach



Outreach activities by members during the national science festival (Forsknings-dagene)

“Marble-ous Photosynthesis”

Marble run game

Photosynthesis video games

School visits from high schools to

learn about plants and photosynthesis

Photosyntech / SPPS

# PLANT PHENOTYPING IN THE ARCTIC

## A USER'S PERSPECTIVE ON THE PLANTEYE F600

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**THOMAS BAWIN**

**PHENO KICKOFF**
**13TH NOVEMBER 2025**

**@KLIMALABTROMSO**

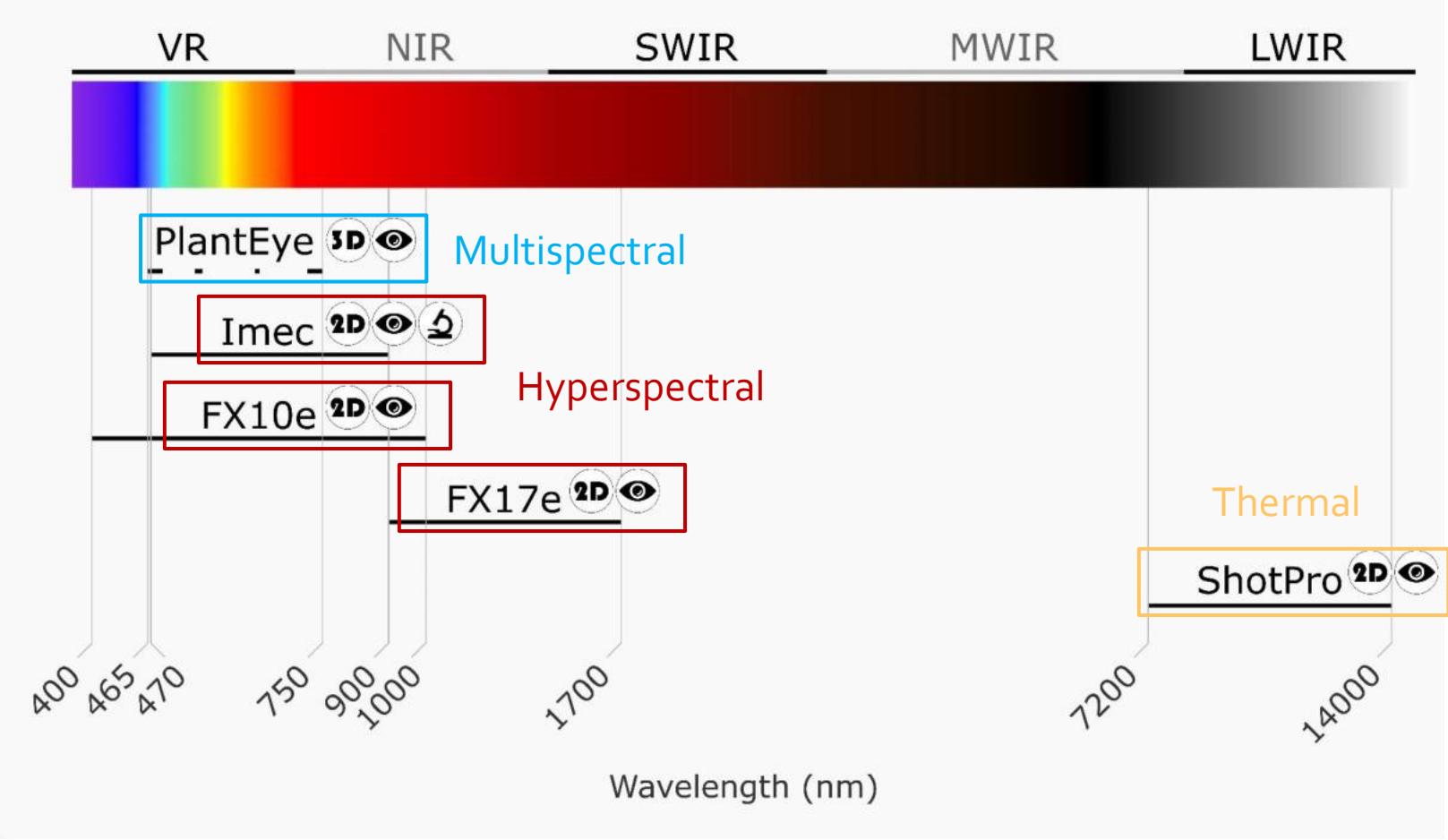
# *The Climate laboratory*

UiT The Arctic University of Norway

NIBIO
NORSK INSTITUTT FOR BIOØKONOMI

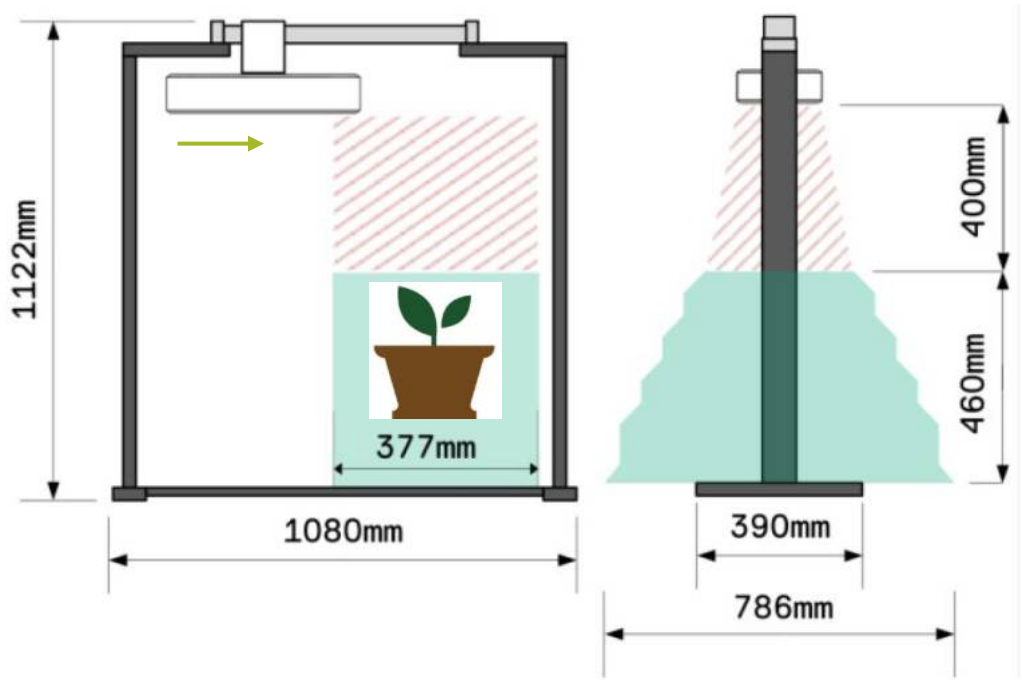
- Climate factors and plant adaptations
- Phytotron: daylight and dark chambers
- Molecular and analytical lab
- Spectral imaging equipment


# *Our imaging instruments*



# *MicroScan*

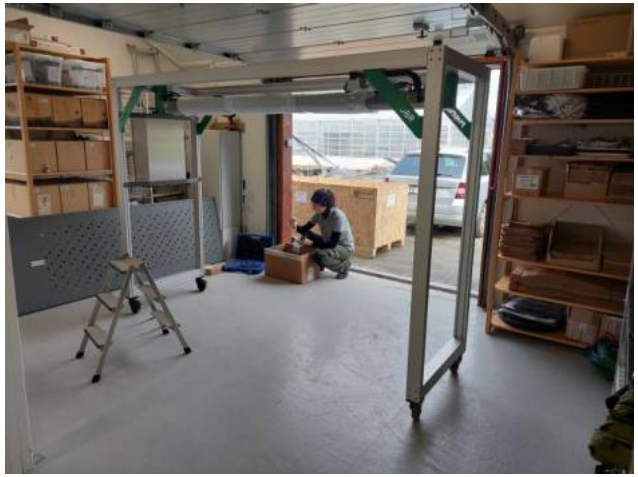
- A single PlantEye F600 scanner
- For small to medium plants



# TraitFinder

PheNo

PHENOSPEX
Smart Plant Analysis

# *Cases overview*

- Ca. 75 experiments and >6500 scans/images
- Ca. 30 plants species/cultivars
- Temperature, light and nutrient effects

*Tomato*

*Radish*

*Pea*

*Maize*

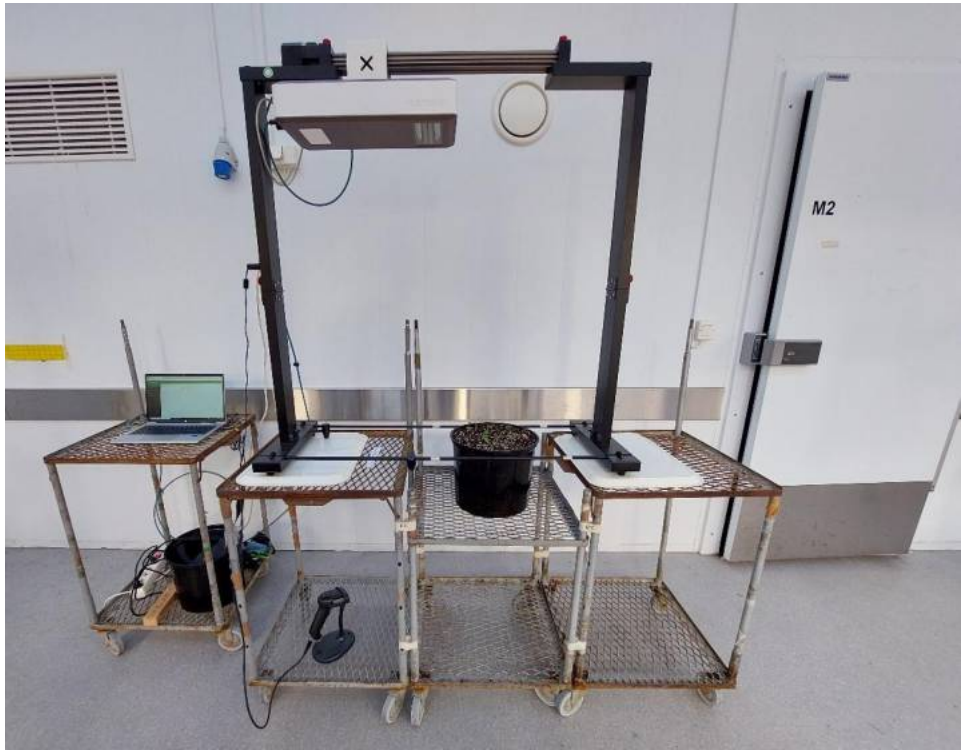
# *Example 1: Forage phenotyping*

Plant adaptability and quality?


# *Controlled experiment*

*Marte Ranvik (UiT/NMBU)*

**Cultivars:** Clover (Gandalf, Vytis), Timothy (Noreng, Jauniai)
**Temperatures:** 12, 15 & 18°C
**Replicates:** 14
**Total:** 168 pots (10L, ca. 30 plants each)

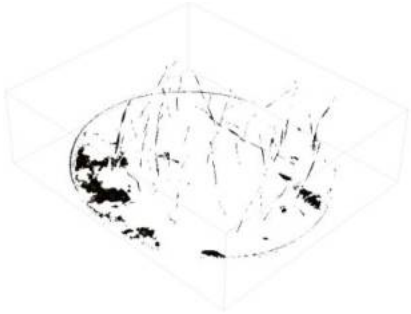


# *PlantEye 3D scans*

**Gandalf 7d**

**Gandalf 21d**

**Gandalf 56d**

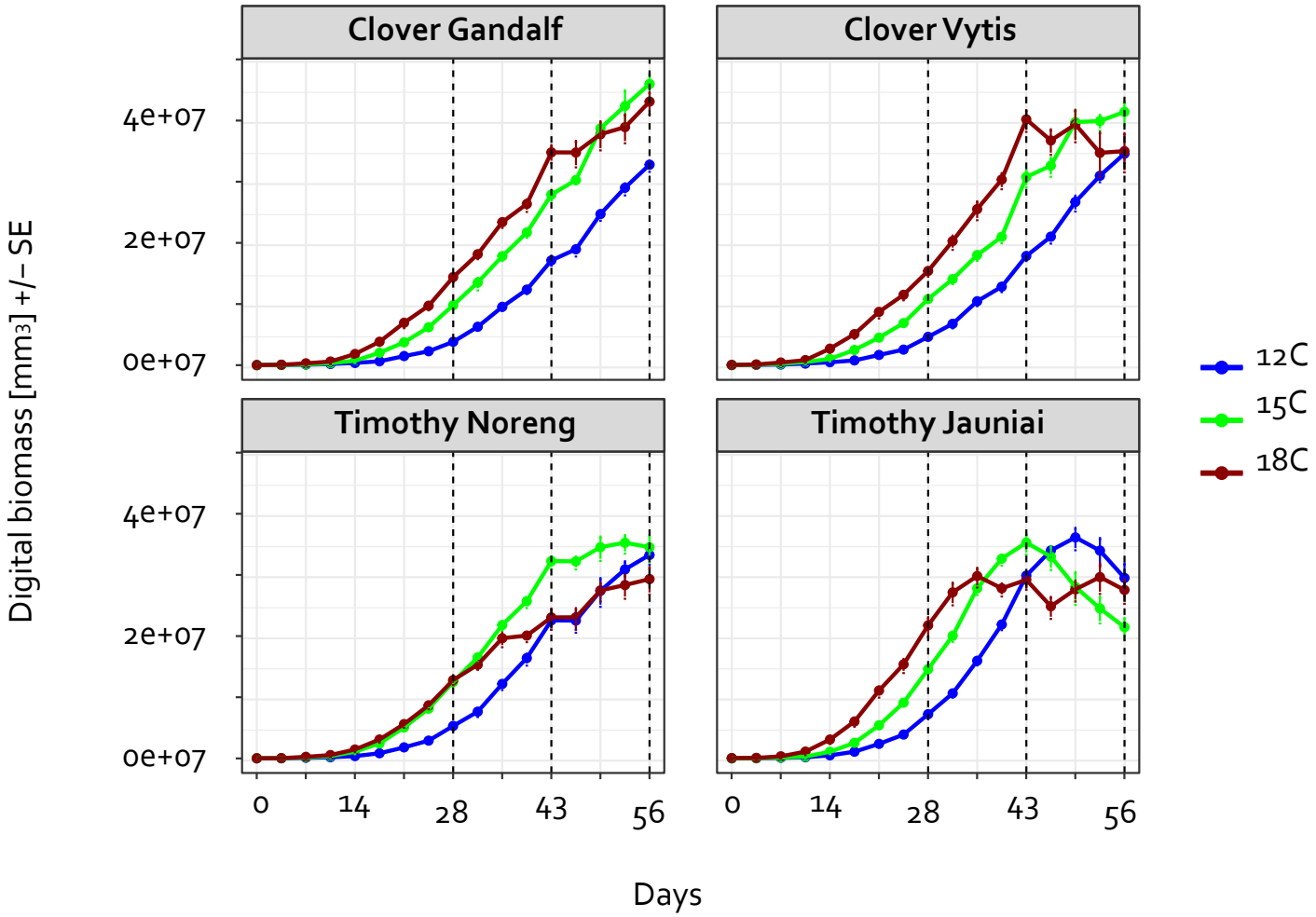


**Noreng 7d**

**Noreng 21d**

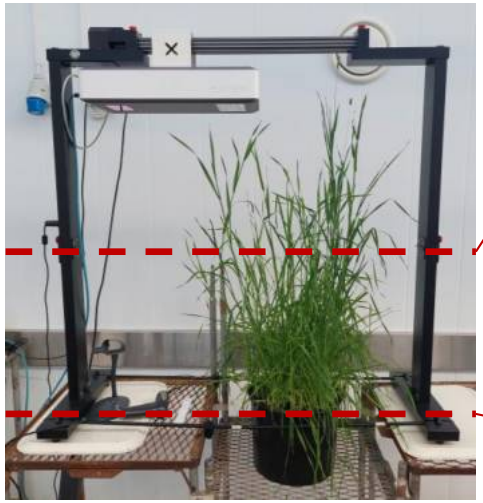
**Noreng 56d**

# *Plant digital biomass*



# *Potential improvements*


- Restricted scanning window
- Does not directly track phenology
- Expertise and supplementary measurements were needed
- … now partly solved with the TraitFinder ☺


# *Example 2: An herbivory case*

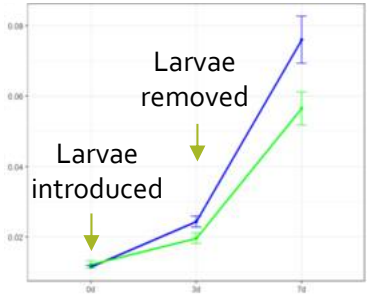
*Anne Muola*

- Plant stress recovery
- Growth and spectral parameters

*Cabbage moth*

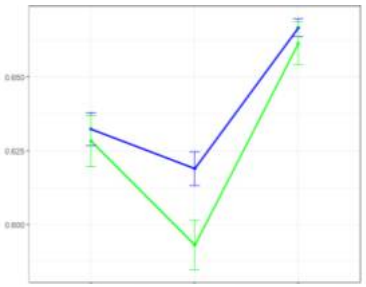
*Målselv turnip*

**Leaf index area**



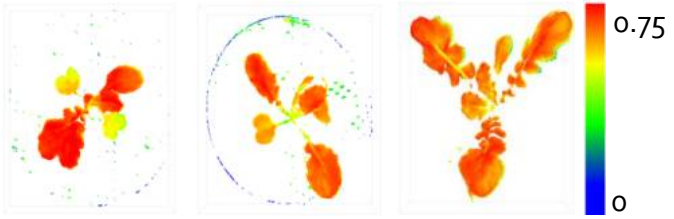

Control
Herbivory

**NDVI**

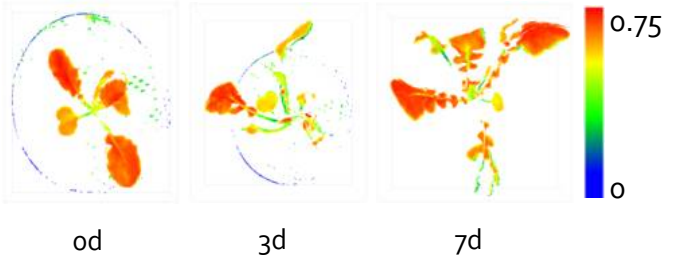



Control
Herbivory

**Control**



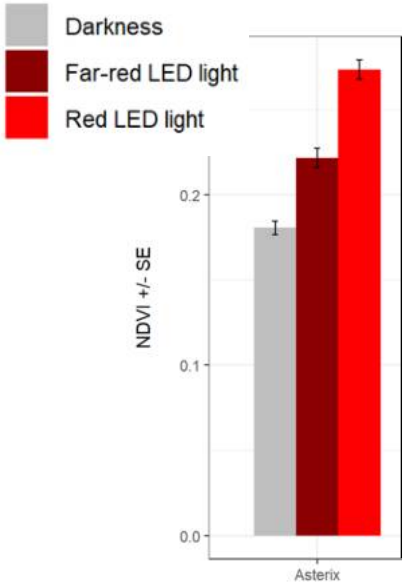

**Herbivory**



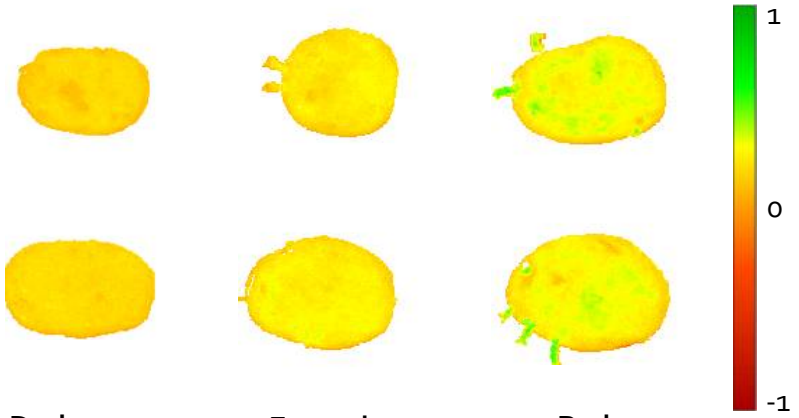
# *Example 3: Potato tubers*

*Jørgen Mølmann*

- Greening of potato tubers under light
- Projection on 3D models brings biological insight




**Normalized difference vegetation index**



# *General considerations*

**You can hardly hurt your experiment while scanning**

**… poor preparation does**

- **User friendly**
  - Simple to learn
  - Intuitive to use & implement
  - Good documentation & support
- **Think ahead**
  - How big will the plants be?
  - Will they need structural support?
  - Will they lean and/or hang below pot rim?
- **Good practices make life easier**
  - Use pots of uniform size
  - Fill pots with soil up to rim
  - Label each pot with barcode, block & unit
  - Etc.

# *General considerations*

**Check your data before drawing conclusions**

- Inspect 3D models for correct processing and completeness
- Inspect spreadsheet for duplicates and outliers
  - Foreign scans
  - Duplicate scans
  - Scans with foreign objects


| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | unit | genotype | g_alias | treatment | timestamp |
| 1103 | 177:01:01 | Clover_Gandalf | Clover_Gandalf | 18C | 2/22/2024 9:02 |
| 1104 | 177:01:01 | Clover_Gandalf | Clover_Gandalf | 18C | 2/26/2024 9:36 |
| 1105 | 177:01:01 | Clover_Gandalf | Clover_Gandalf | 18C | 2/29/2024 9:37 |
| 1106 | 177:01:01 | Clover_Gandalf | Clover_Gandalf | 18C | 3/4/2024 9:26 |
| 1107 | 177:01:01 | Clover_Gandalf | Clover_Gandalf | 18C | 3/7/2024 13:50 |
| 1108 | 177:01:01 | Clover_Gandalf | Clover_Gandalf | 18C | 3/11/2024 9:25 |
| 1109 | 177:01:01 | Clover_Gandalf | Clover_Gandalf | 18C | 3/14/2024 9:38 |
| 1110 | 177:01:01 | Clover_Gandalf | Clover_Gandalf | 18C | 3/18/2024 9:05 |
| 1111 | 177:01:01 | Clover_Gandalf | Clover_Gandalf | 18C | 3/21/2024 10:04 |
| 1112 | 177:01:01 | Clover_Gandalf | Clover_Gandalf | 18C | 3/25/2024 9:26 |
| 1113 | 177:01:01 | Clover_Gandalf | Clover_Gandalf | 18C | 3/28/2024 11:11 |
| 1114 | 177:01:01 | Clover_Gandalf | Clover_Gandalf | 18C | 4/2/2024 9:30 |
| 1115 | 177:01:01 | Clover_Gandalf | Clover_Gandalf | 18C | 4/2/2024 9:30 |
| 1116 | 177:01:01 | Clover_Gandalf | Clover_Gandalf | 18C | 4/2/2024 9:32 |
| 1117 | 178:01:01 | Clover_Gandalf | Clover_Gandalf | 18C | 2/29/2024 11:50 |
| 1118 | 178:01:01 | Clover_Gandalf | Clover_Gandalf | 18C | 2/22/2024 9:22 |

# *Acknowledgment*



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Corine Faehn
(UiT)

Forskningsrådet

ABYORB

PheNo

UiT The Arctic University of Norway

NIBIO
NORSK INSTITUTT FOR BIOØKONOMI

QualySense
Member of the Ferrum Group

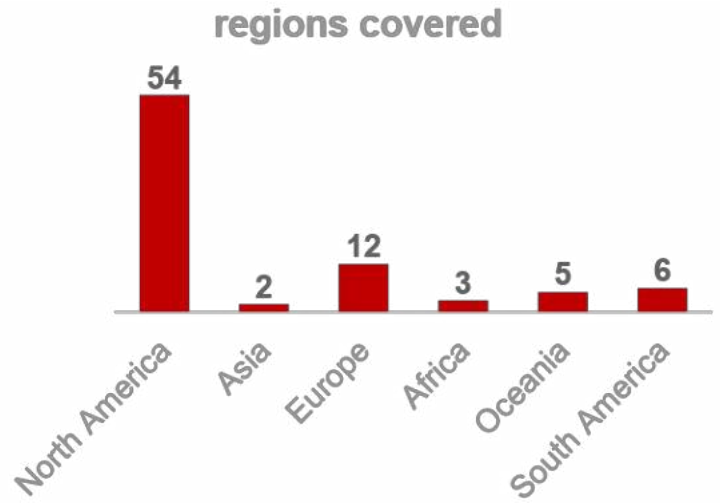

# QSorter®

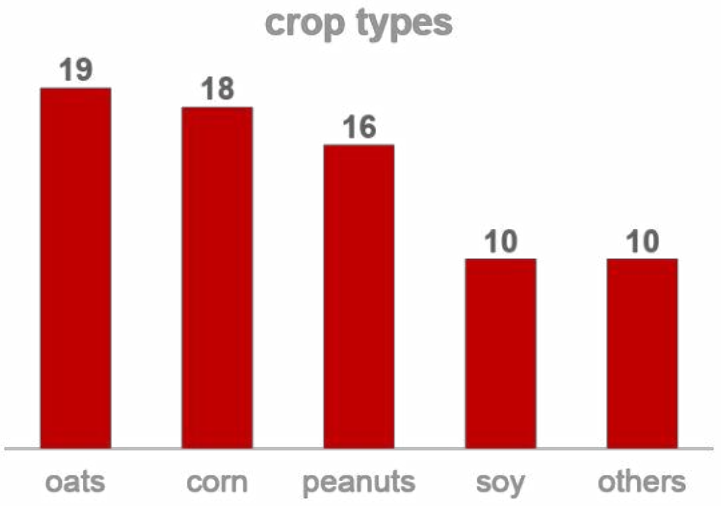
High-Speed Single Kernel Analytics and Sorting Solutions for Seed, Grains and Beans

**30 to 3'000 seeds per second**

# QSorter® Installation base and customers

**80+ units installed since 2015**



# QSorter® Laboratory and Processing Platforms

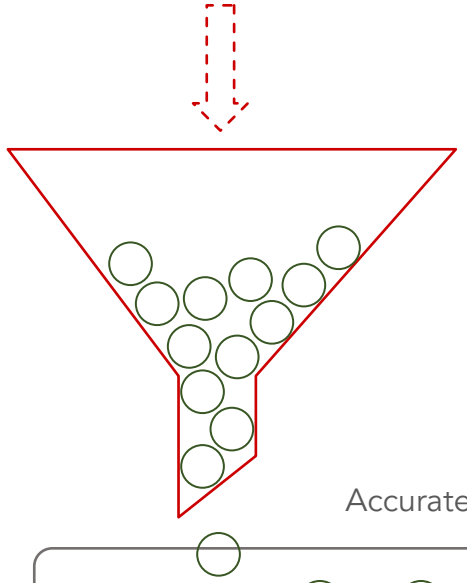
## QSorter® Explorer

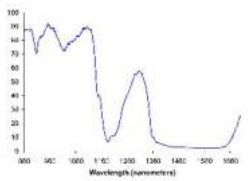
30 kernels/s


## QSorter® Horizon

3’000 kernels/s

# QSorter® How does it actually work?

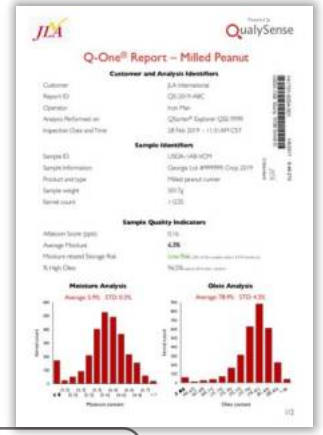




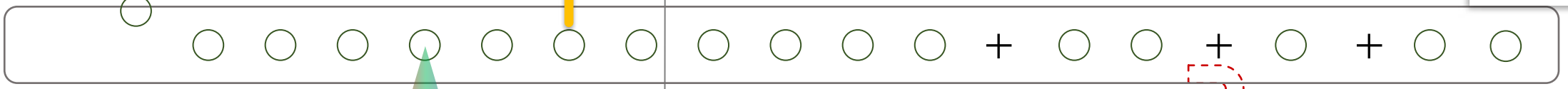
High Resolution
Near Infrared Spectra

Machine Learning Algorithms

Digital Quality Reports



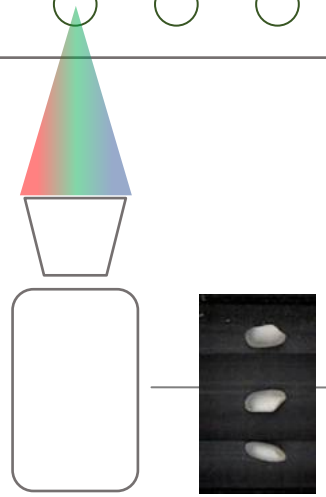

Accurate Positioning



High Speed Transport

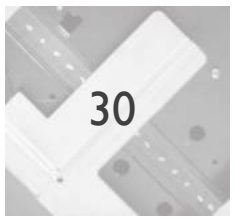
Accurate Sorting

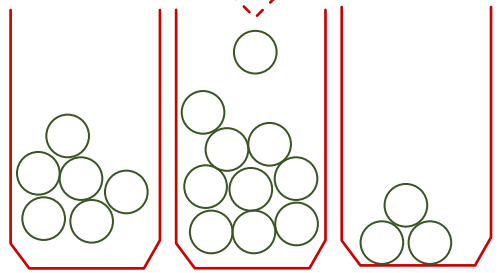
The **patented QSorter® technology***, allows to **measure and sort consistently** and **non-destructively** by the physical and biochemical quality of **each individual grain** at a **very high-speed.**





2D/3D Imaging

Sorted Classes

*WO 2016/000967 A1, WO 2012/145850 A1 and CH 702 891 A1

# QSorter® Solution Portfolio

## Soybeans

Oleic Breeding

Protein, Fat and Oil Contents

Physical Purity
Hilum Colour

## Rice

Chalkiness and Broken Level

Quality Control

Geometry

## Corn

Haploid/Diploid Sorting

Discards Recovery

Physical Purity

## Peanuts

Defect analysis

Size, Geometry, Colour

Oleic Breeding, Protein, Sugar
Aflatoxin Management

## Coffee

Defect Analysis

Size Analysis

Moisture
Colour

## Wheat

Protein
Geometry
Hardness
Moisture
Colour

## Oats

Gluten Contamination Control
Geometry
Moisture
Colour

## Sweet Corn

Dent Corn (GMO) Removal
Colour
Pre-Germ Removal

## Barley

Protein
Geometry
Hardness
Moisture
Colour

## Hemp

Physical Purity

# QSorter®Several Quality Parameters for Real Insights

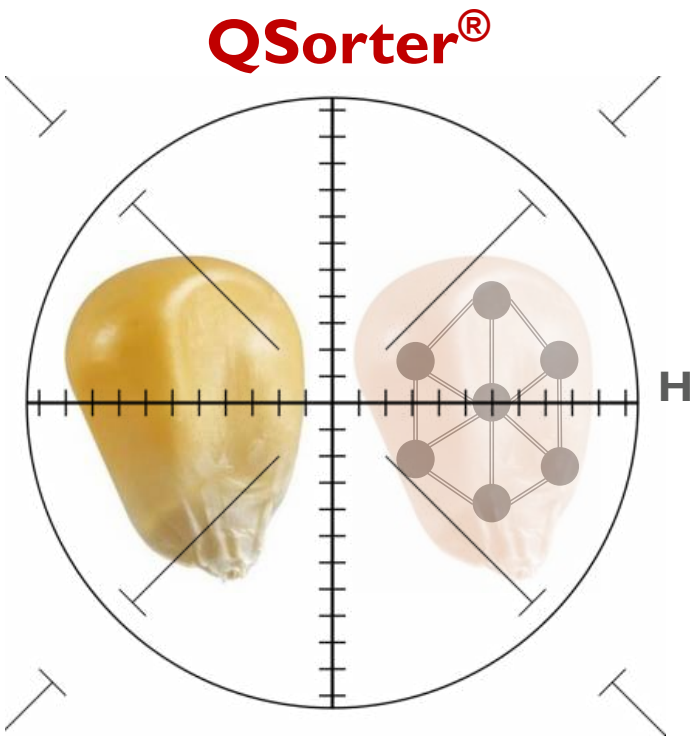
## PHYSICAL PARAMETERS

| | |
|---|---|
| Length: | 10 mm |
| Width: | 7 mm |
| Thickness: | 5 mm |
| Weight: | 0.11 g |
| RGB Color: | (34,139,34) |
| Broken: | 10% |

## COMPOSITIONAL PROPERTIES

| | |
|---|---|
| Oil: | 20.1% |
| Moisture: | 12.3% |
| Starch: | 23.1% |
| Protein: | 10.2% |

**2D/3D Color Image**




**High Resolution Spectroscopy Signal**

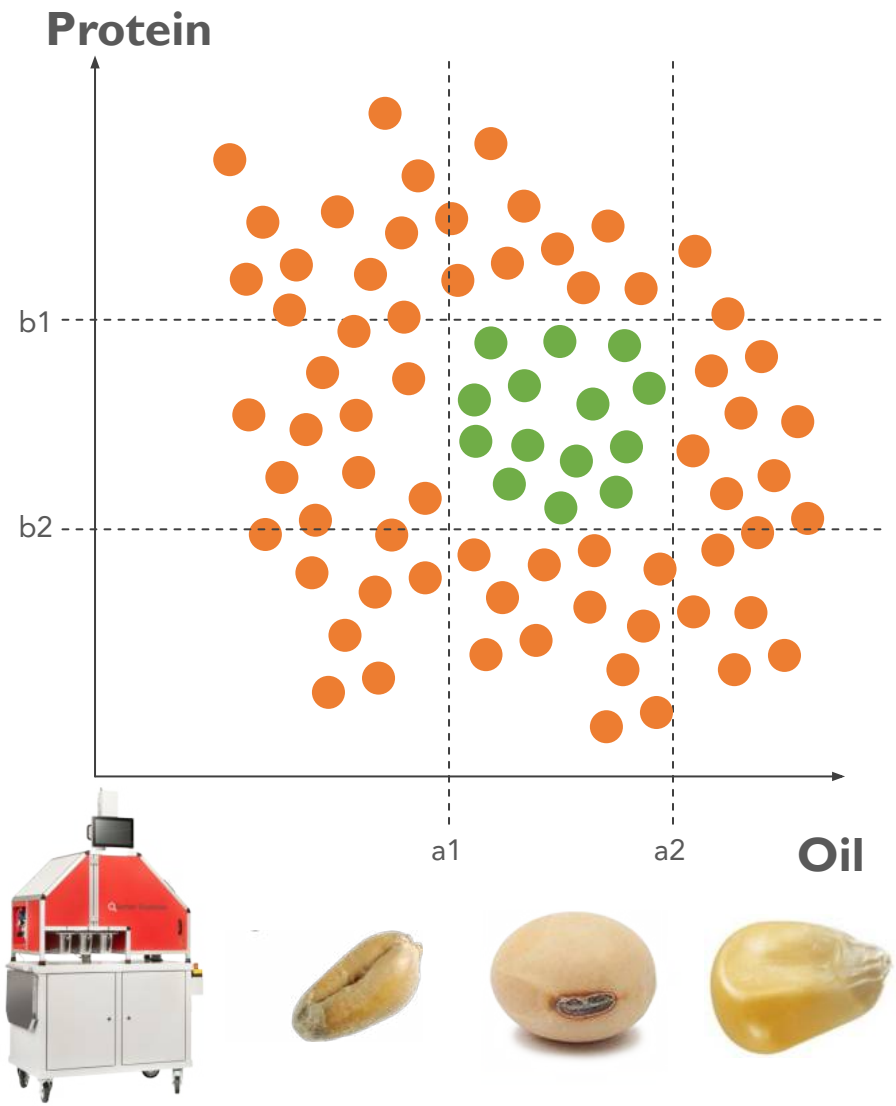
## VISIBLE DEFECTS

| | |
|---|---|
| Discolored: | 2% |
| Black bean: | 4% |
| Immature: | 1% |
| Insect Damaged : | 3% |

## PERFORMANCE AND PREFERENCE

| | |
|---|---|
| Germination: | Very High |
| Purity: | 97% |
| Aroma: | 4.3 |
| Toxin: | Not present |
| Shelf life | Long |

# QSorter® Fast Phenotyping – **Breed with the Best Seeds**




During the breeding process, scientists select which seeds to bring into the next generation by means of phenotyping tests, genetic tests and field trials. The phenotyping tests are generally slow, expensive and destructive and, therefore, only a few seeds are analyzed, which does not allow to produce results with a strong statistical confidence. In addition, different types of equipment need to be used to measure all the desired parameters.

The QSorter® Explorer is a high-speed single kernel phenotyping that helps scientists breeding better and faster.

Some of its key features are:

- Measurement of several phenotyping parameters in one pass
- Automatic selection of the desired seeds
- Quality distribution for each measured parameter
- Single seed speed from 10 to 60 seeds/second
- Non-destructive and non-invasive analyses

# QSorter® Explorer Demonstration Video

# QSorter® SQI² Cloud Platform Demonstration

QualySense
Member of the Ferrum Group

- Dashboard
- Organization Management
- Users
- Devices
- Quality Information
- Reports
- Standards Settings
- Advanced Analytics
- User Settings
- Do you need help?
- Support

## Sample Tracking

en | qs-name admin@mail.com

**Sample Code:** Amostra20_old
**Algorithm:**
**Recipe:** Default.json
**Date and Time:** 2025-11-11T17:15:36.501067+00:00
**QSorter SN:** QSE23-207
**Filename:** qualysense_datafile-2025-11-11_17-15-36.json

☆ ☆ ☆ ☆ ☆

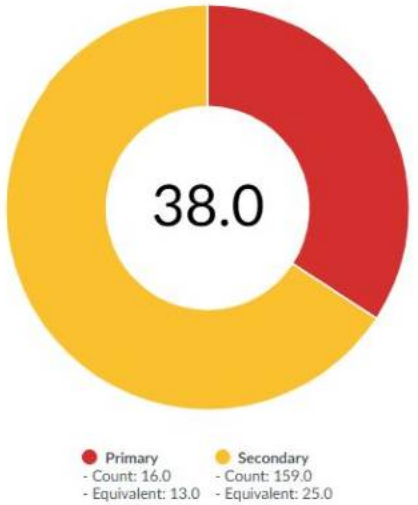
Inspection Remark:

Download Report | SCA | Active | PDF

Summary Quality | Grading System | Agronomy | Summary Defects | Peaberries | Defects | Biochemistry | Size | Colour

## Highlights

| | |
|---|---|
| Defects in % Weight | 18.0 [%] |
| Foreign Matter in % Weight | 0.4 [%] |
| Peaberry in % Weight | 15.9 [%] |
| BGS in % Weight | 4.1 [%] |
| Sample Size (95% sound beans) | 13 |
| Moisture (ISO6673) | 11.1±8.6 [%] |
| Absolute Insect Damaged Number | 51 |
| Absolute Insect Damaged Weight | 6.0 [g] |




| | |
|---|---|
| Sample Weight | 100 [g] |
| Reference Weight | 300 [g] |
| Equivalent Reference | 114 |

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qualysense@ferrum.net | www.qualysense.com

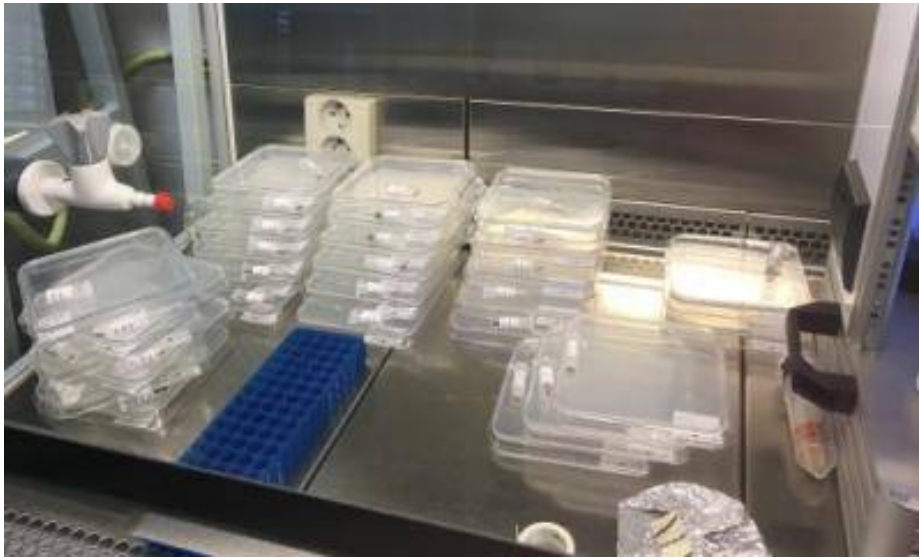
**Ferrum Analytics & Sorting AG**
Industriestrasse 11/13 | 5503 Schafisheim | Switzerland

# Seeds, the bottleneck of plant growth

Labdeers

Tereza Polis

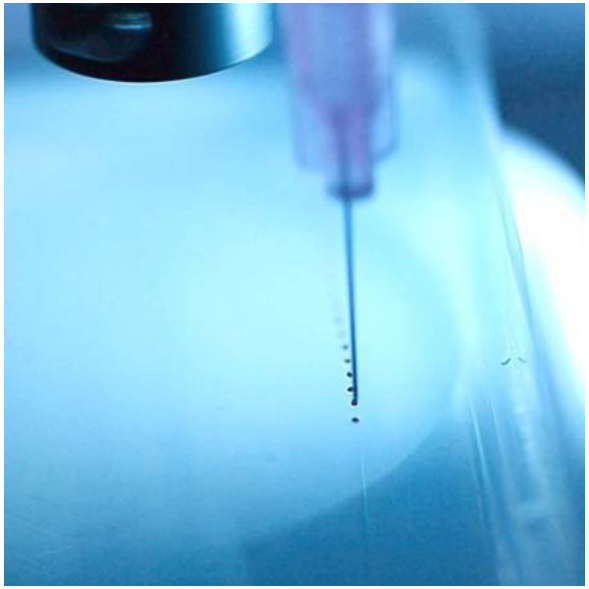
# Boxeed for Science

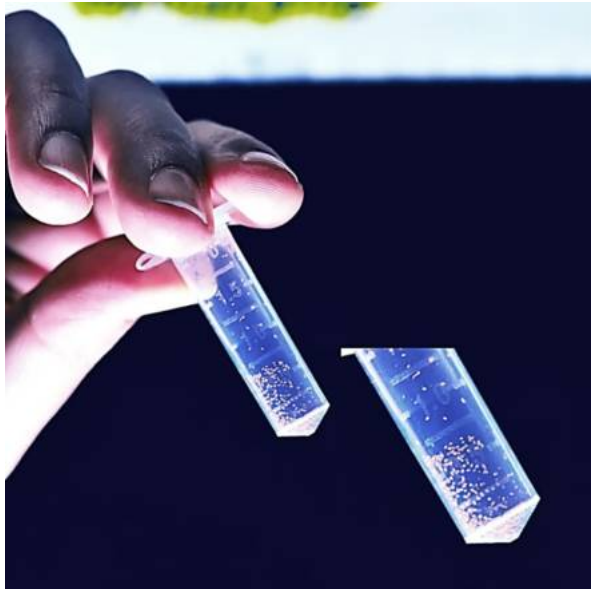


# WHY?

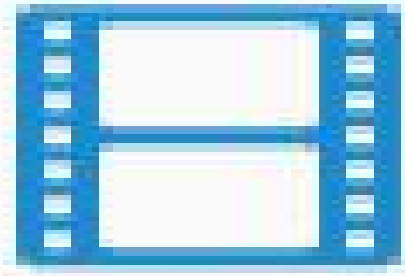
Labdeers

# Boxeed for Science

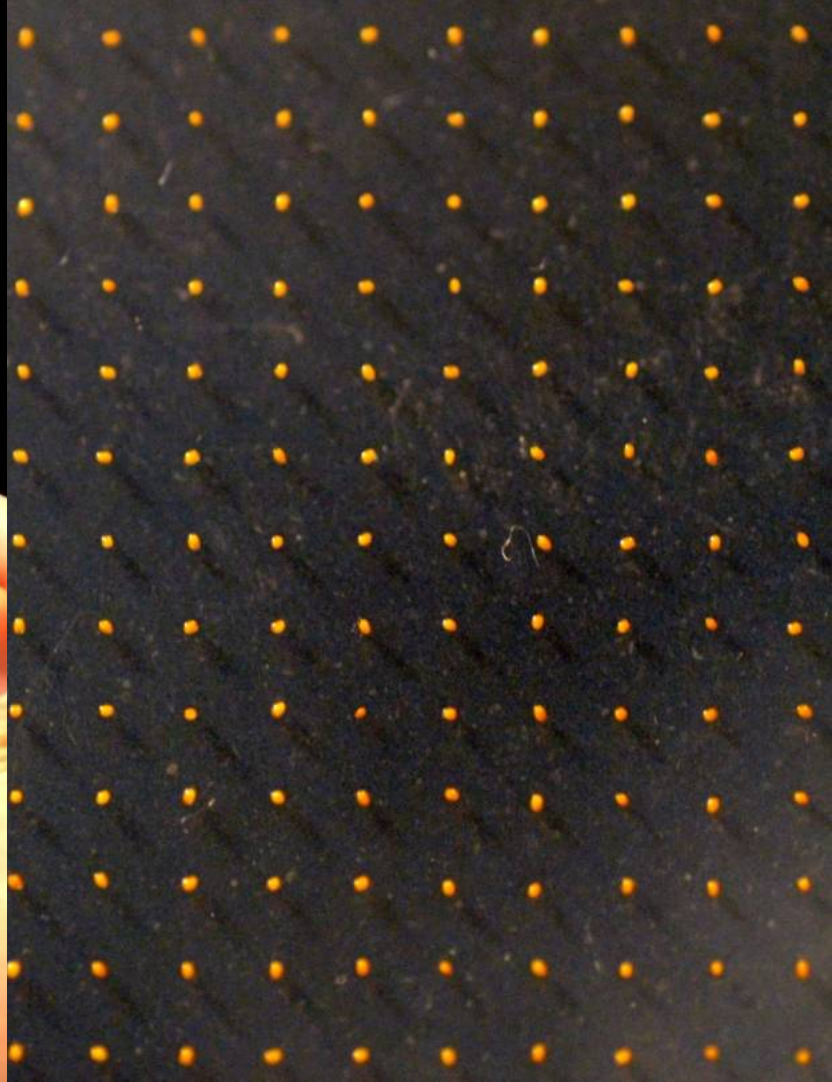




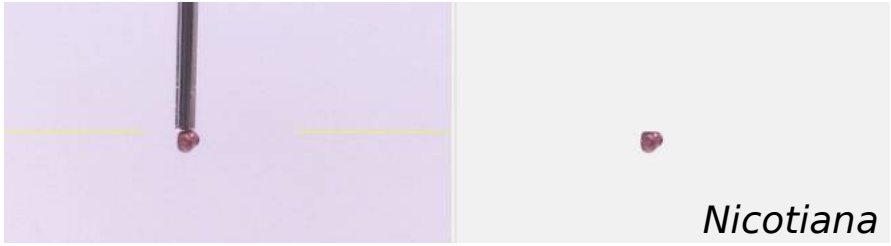
Labdeers

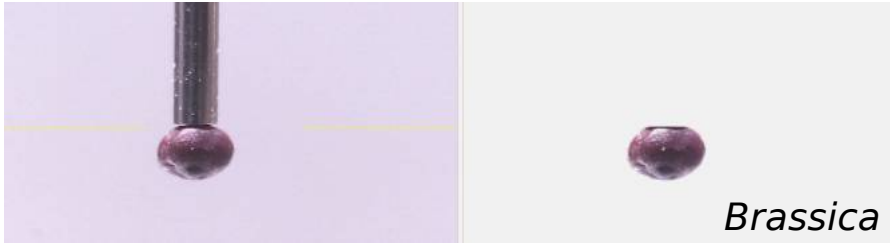



Labdeers

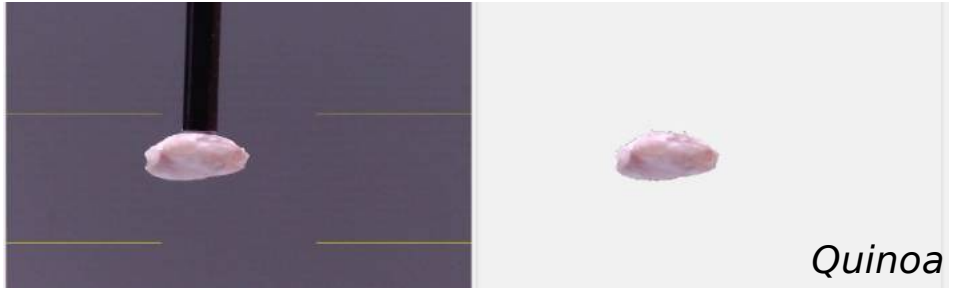


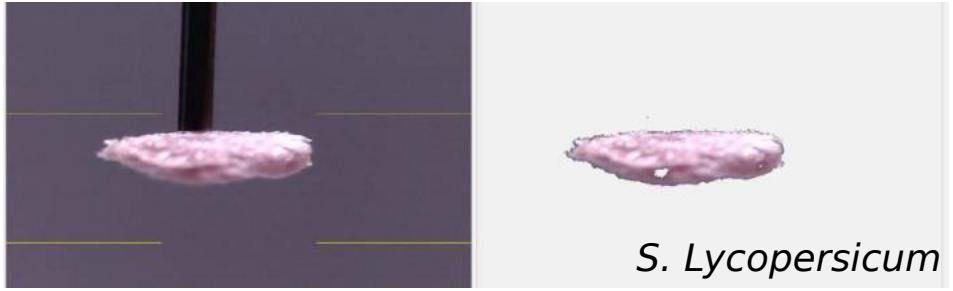
# Large seeds image analysis



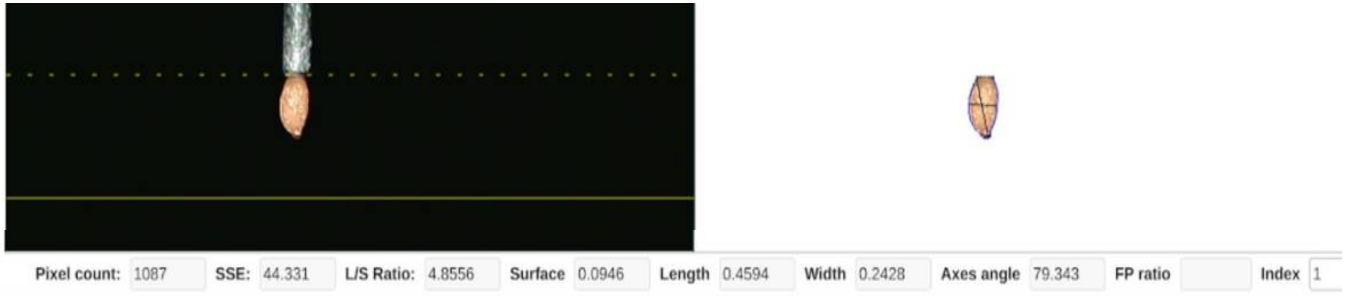


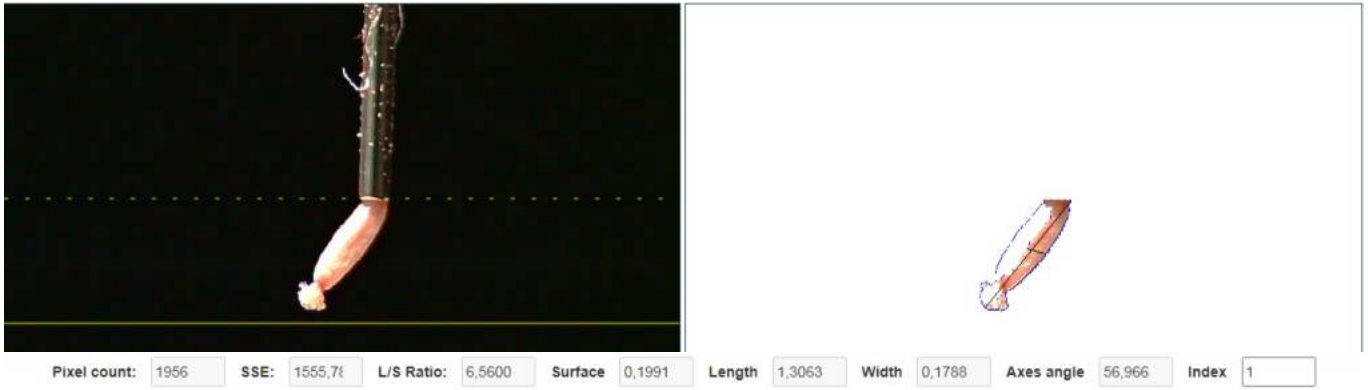



Labdeers

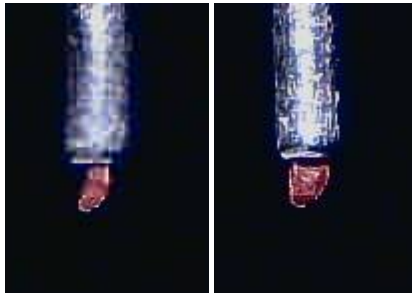
# Seeding starts with seed analysis

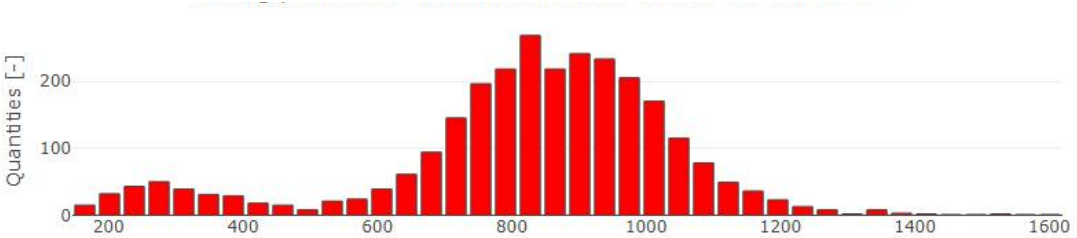


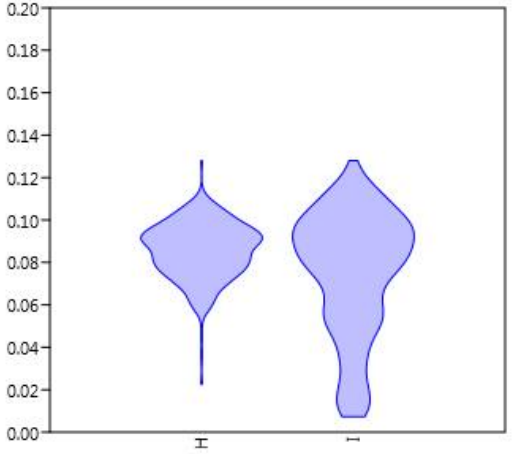



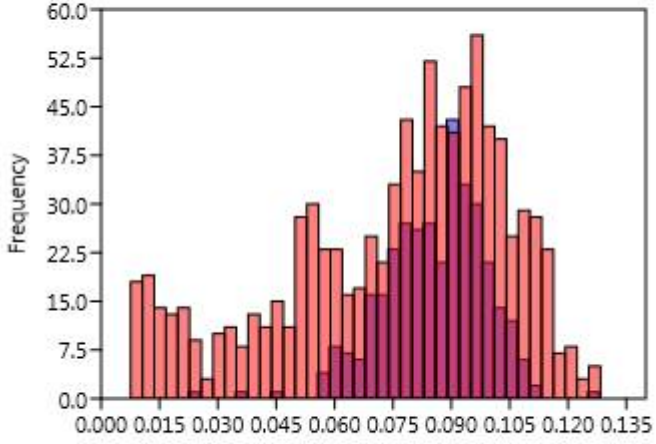

Labdeers

# Seed size in 2D projection



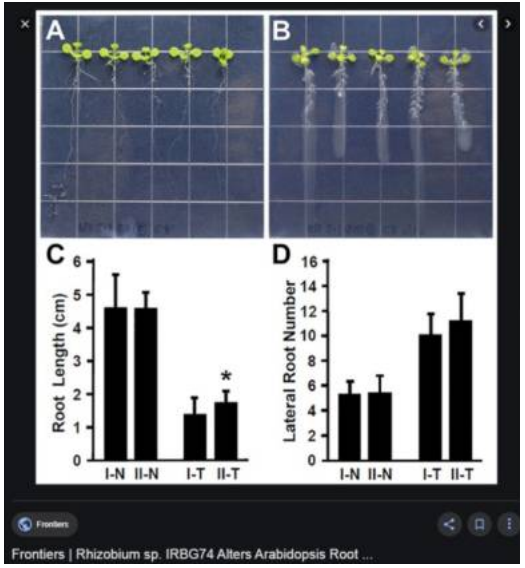


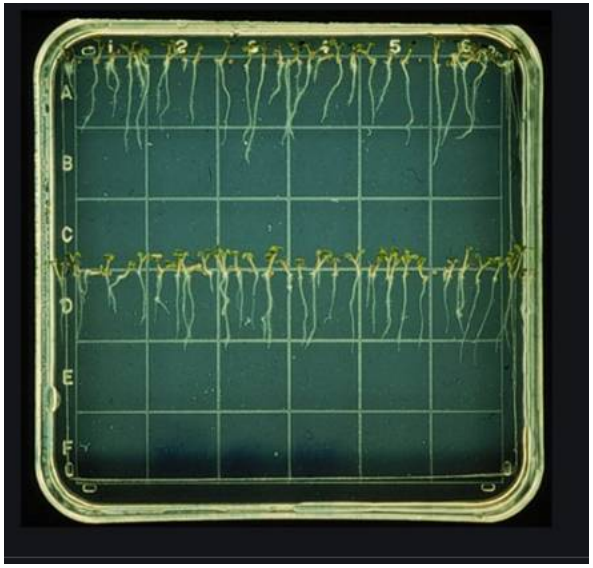




Labdeers

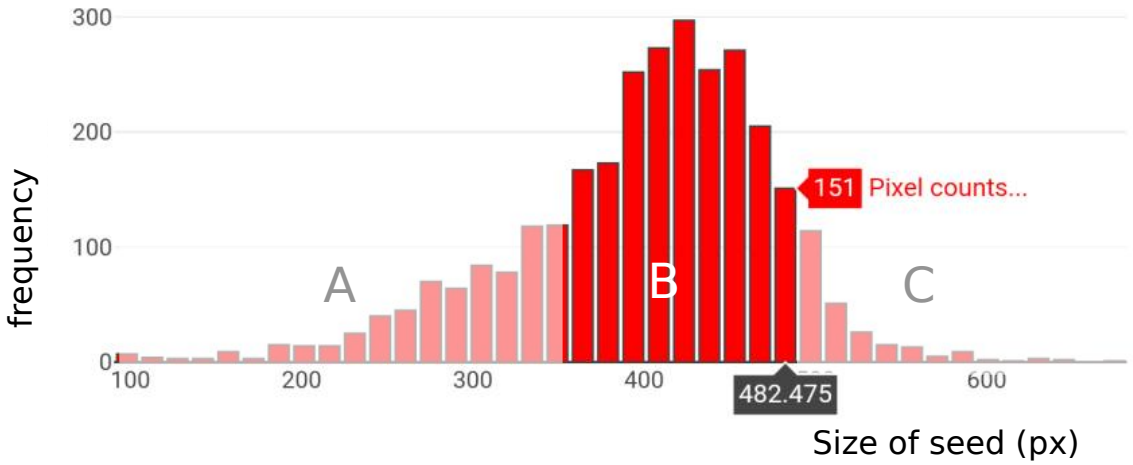
# Natural variability

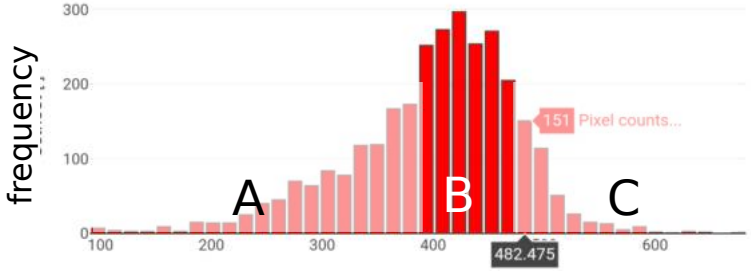
https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1365-3040.2010.02243.x

# Seed size sorting

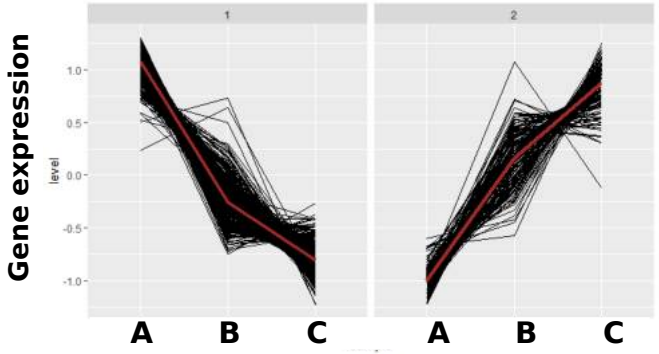


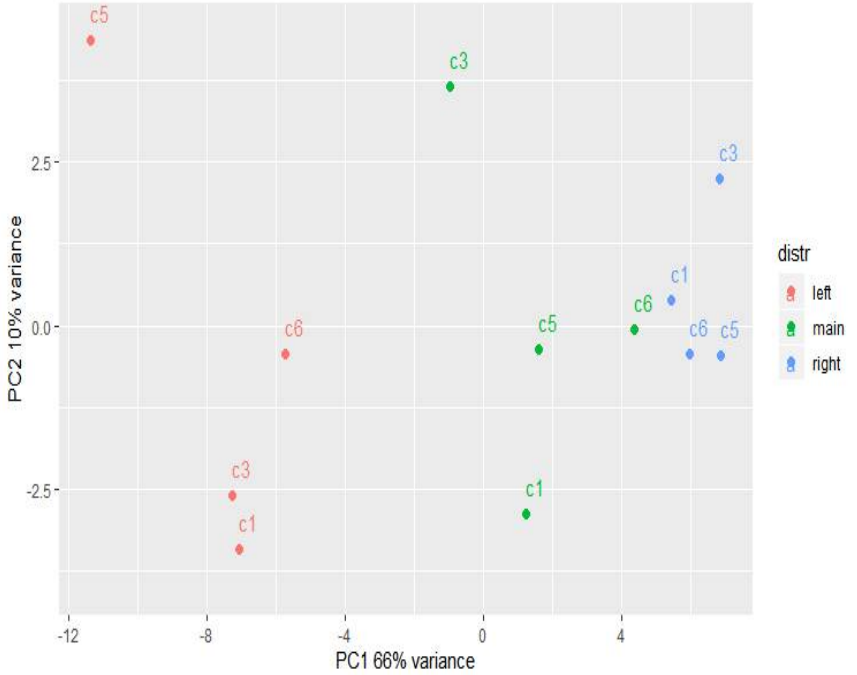

Labdeers

# Transcriptomic analysis




**TRANSCRIPTOM**

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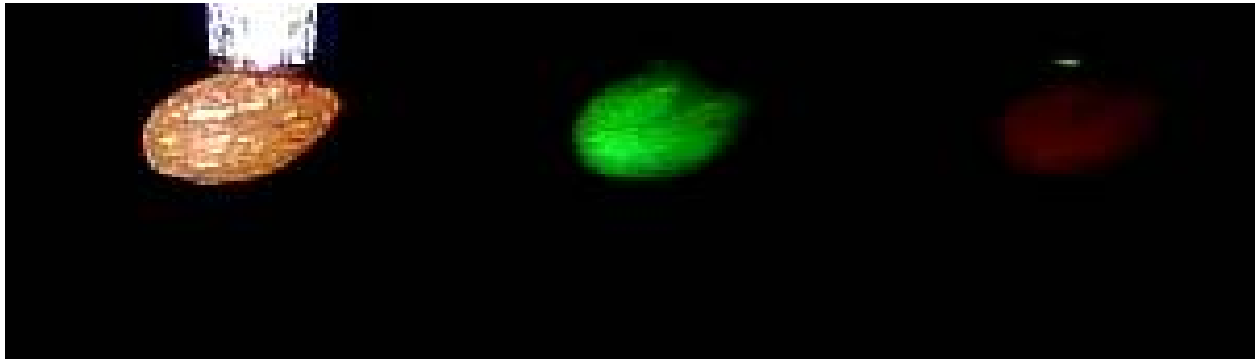
Labdeers

# VOLUME AND 3D RECONSTRUCTION

Labdeers

# VOLUME AND 3D RECONSTRUCTION

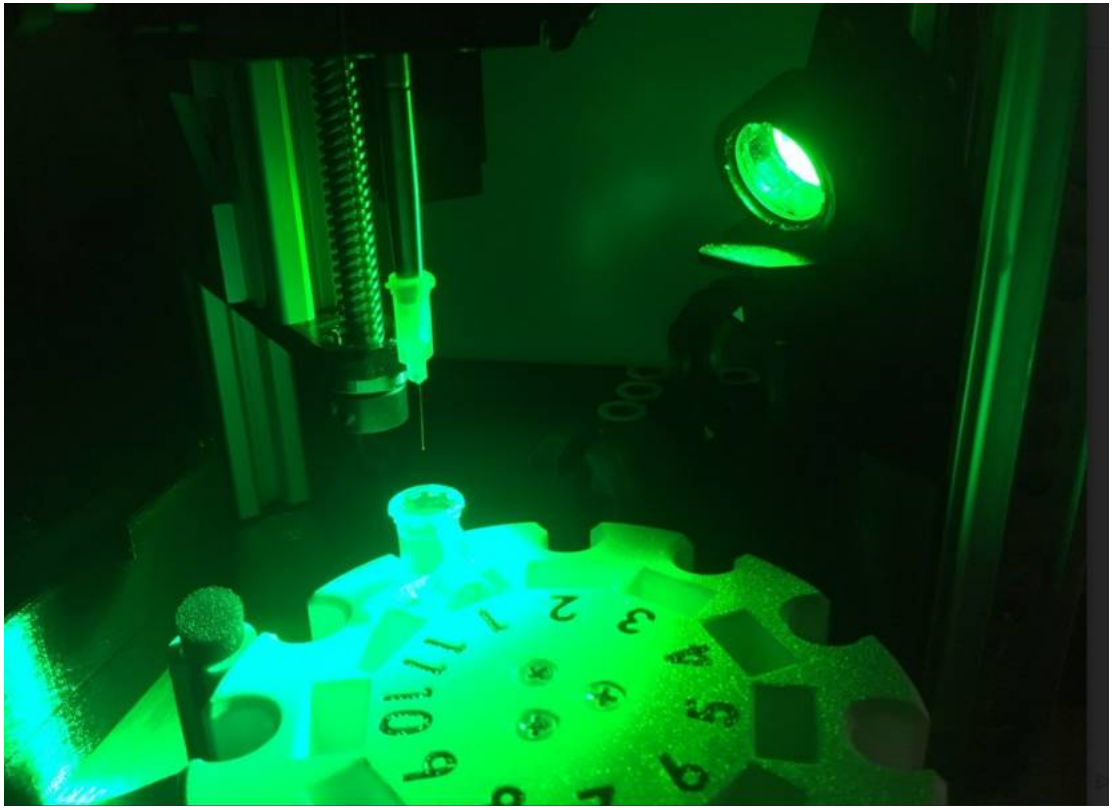


Labdeers

# TECHNOLOGY DRIVEN SCIENCE

Labdeers

# Dim green sowing



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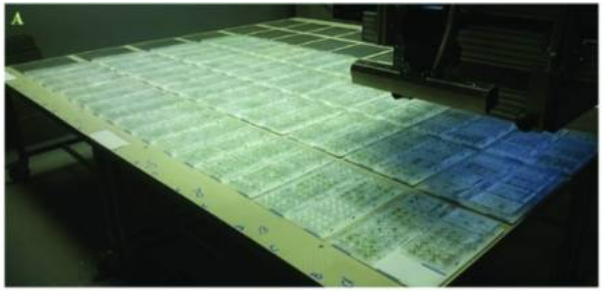
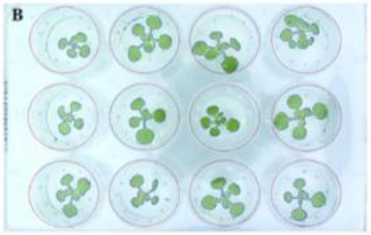
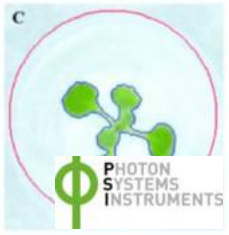
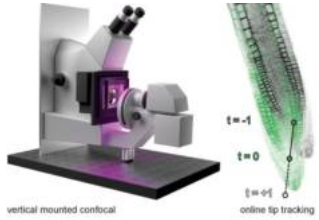
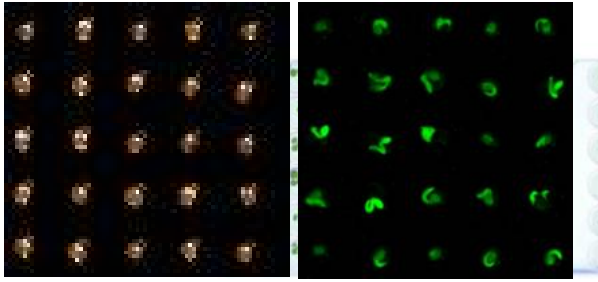
# Phenotypical analysis

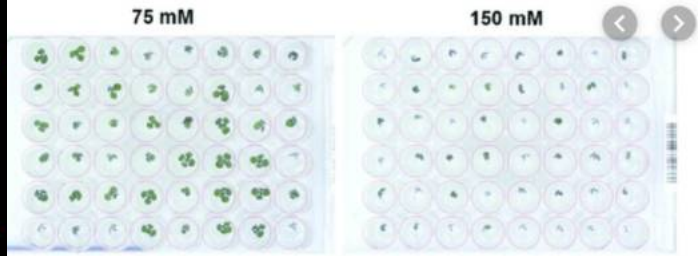



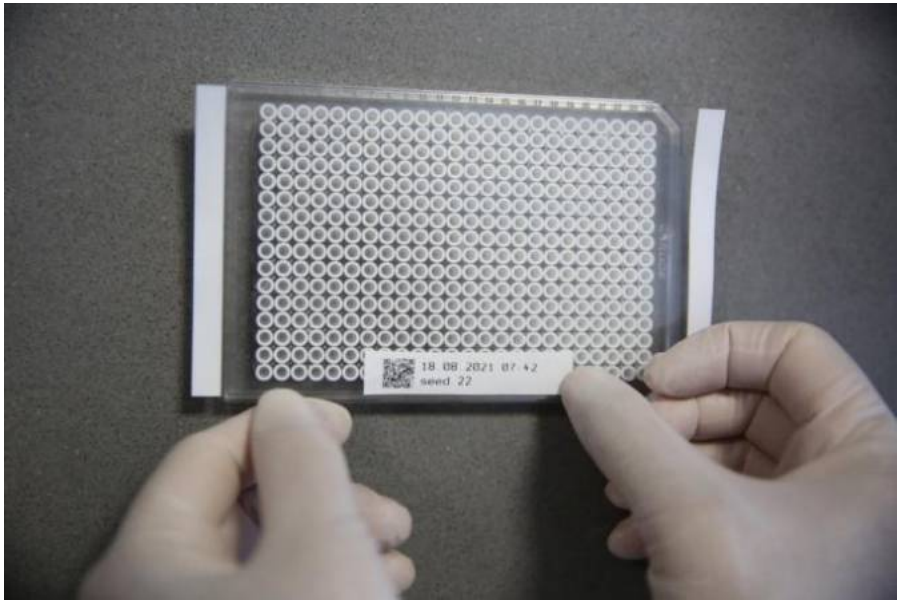



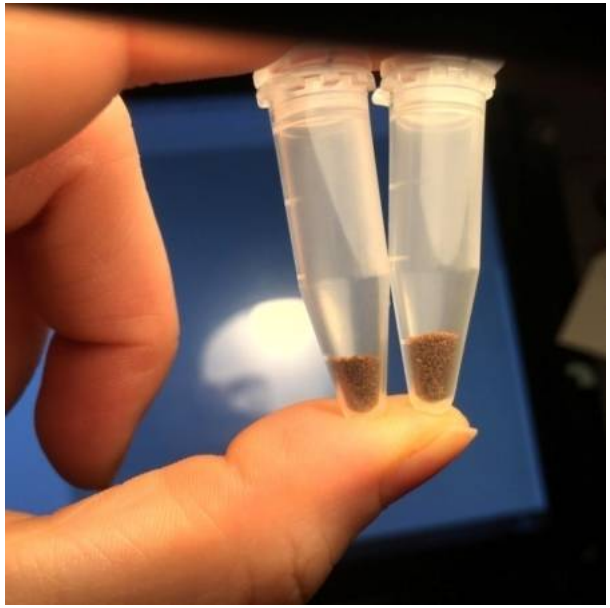





# Seed Penotyping



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# Seeds, the bottleneck of plant growth

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