

# PHENOSEM: Phenotyping services for seed testing from dry seed to seedling

## A collaborative phenotyping facility in Angers

Biologists, pathologists and computer scientists collaborate with engineers for developing tools adapted to seed and seedling study.

Several traits can be measured on the same seed to define seed quality and to better understand seed establishment in field.

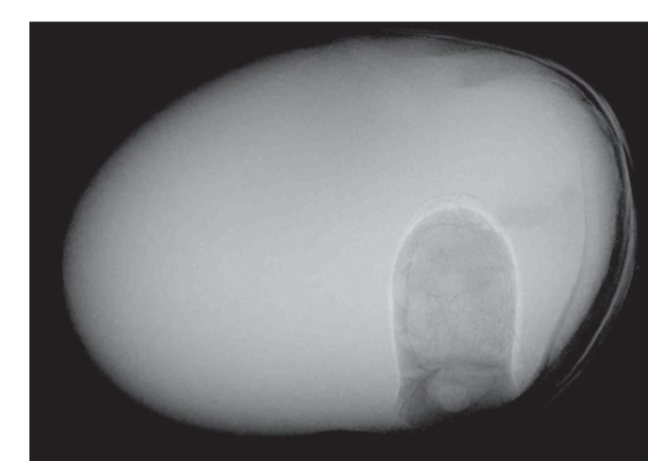
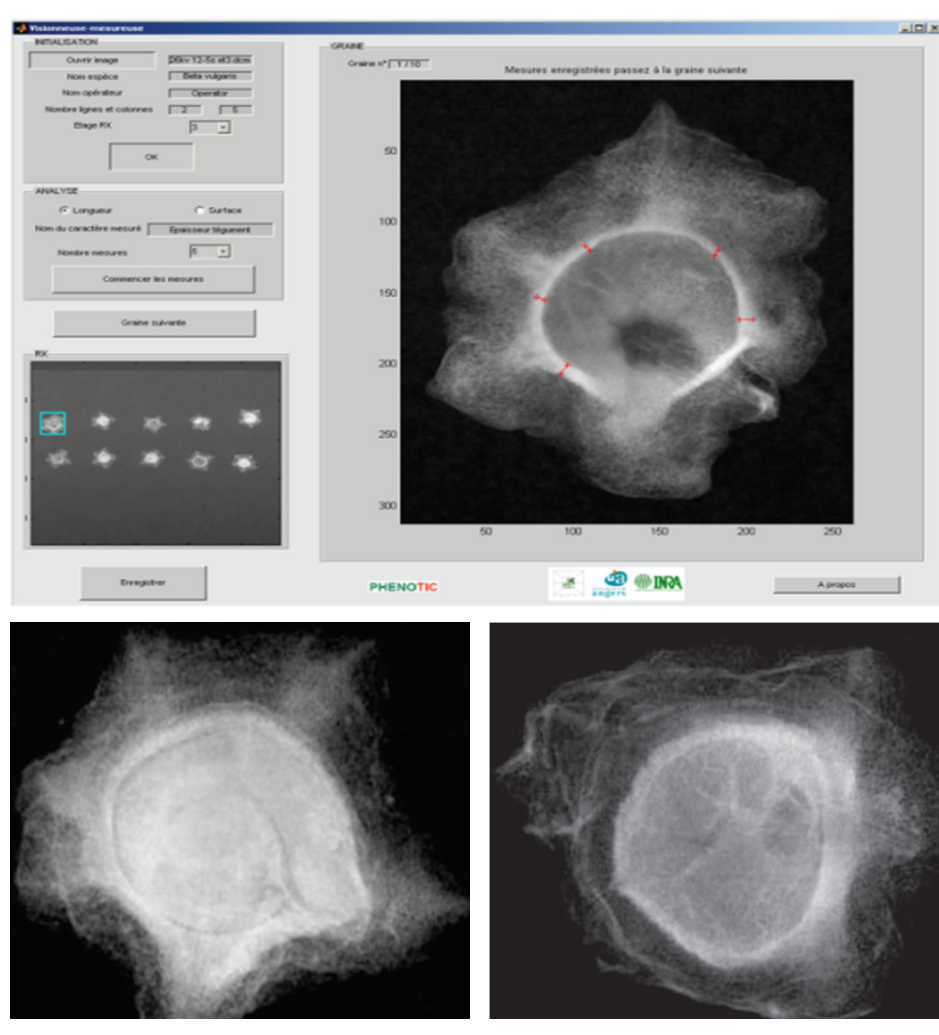
## Non invasive measurements on seeds

### Internal structure

X-ray imaging  
Faxitron MX-20DC12



Visimerx: Semi-automatic tool for X-ray imaging classification and embryo measurements

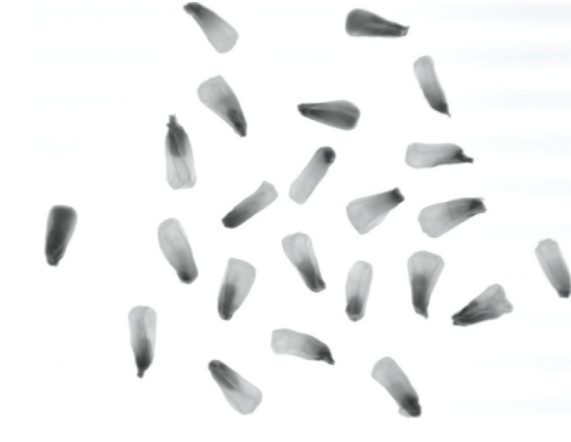


Insect (*Bruchus rufimanus* Boh)  
damage on broad bean seed  
X-ray on the top, photo on the bottom



### Seed morphological traits

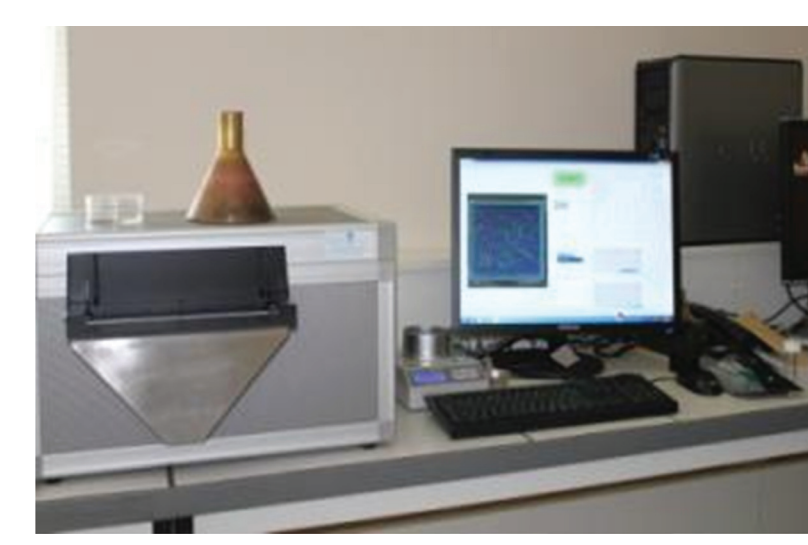
Genetic differences on sweet corn



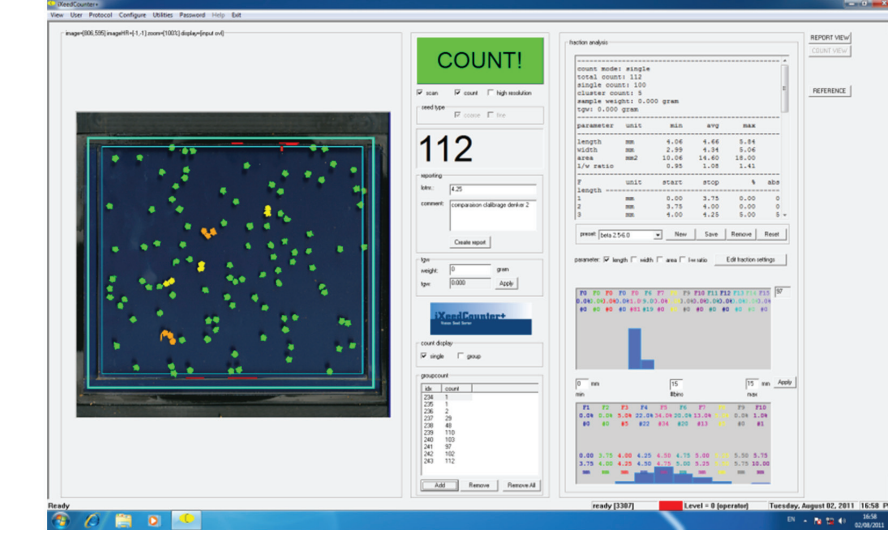
Seed calibration by image analysis



1xseed

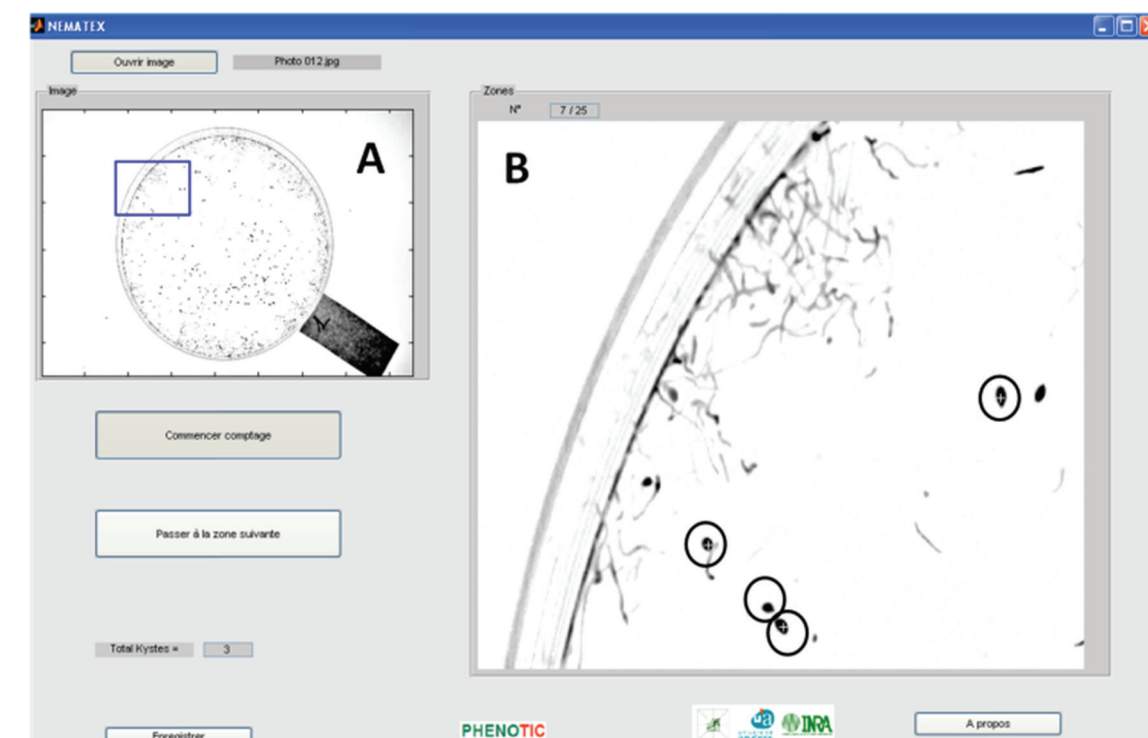
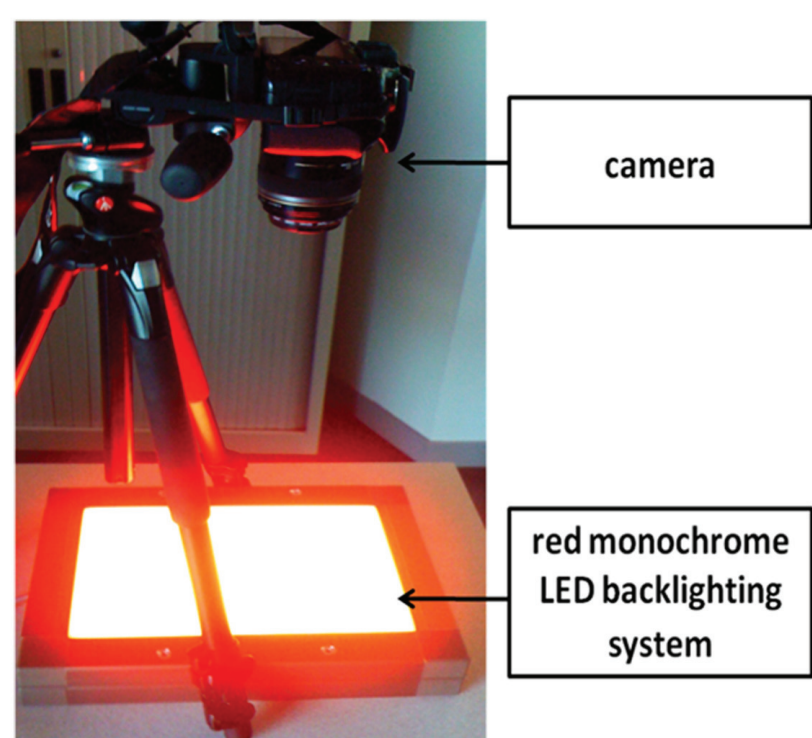


Thousand seed weight by image analysis



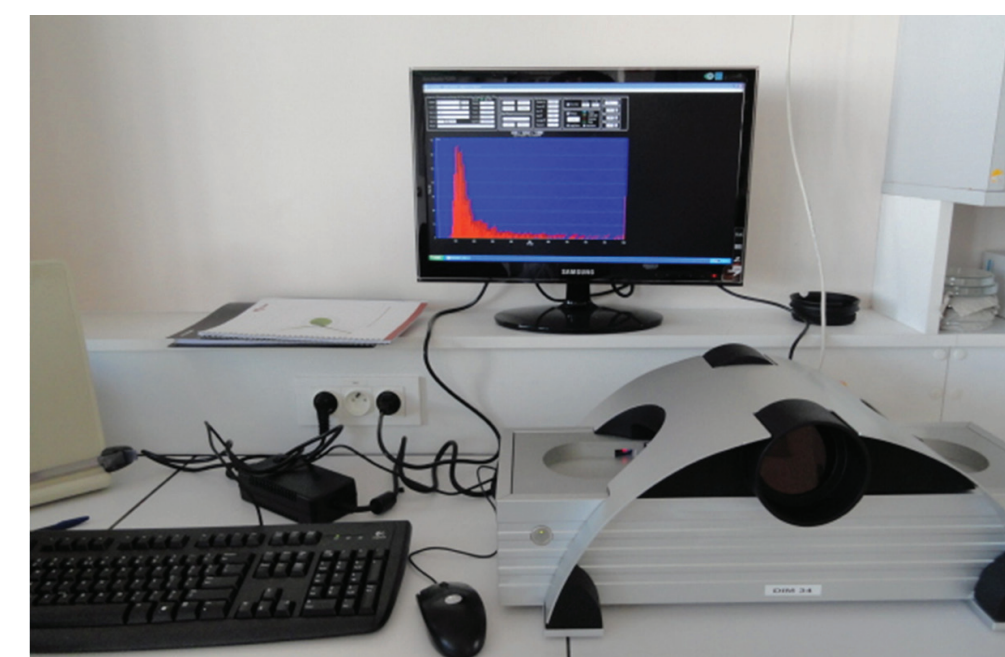
### Seed health

Nematex: Computer vision semi-automatic tool for cysts nematode counting

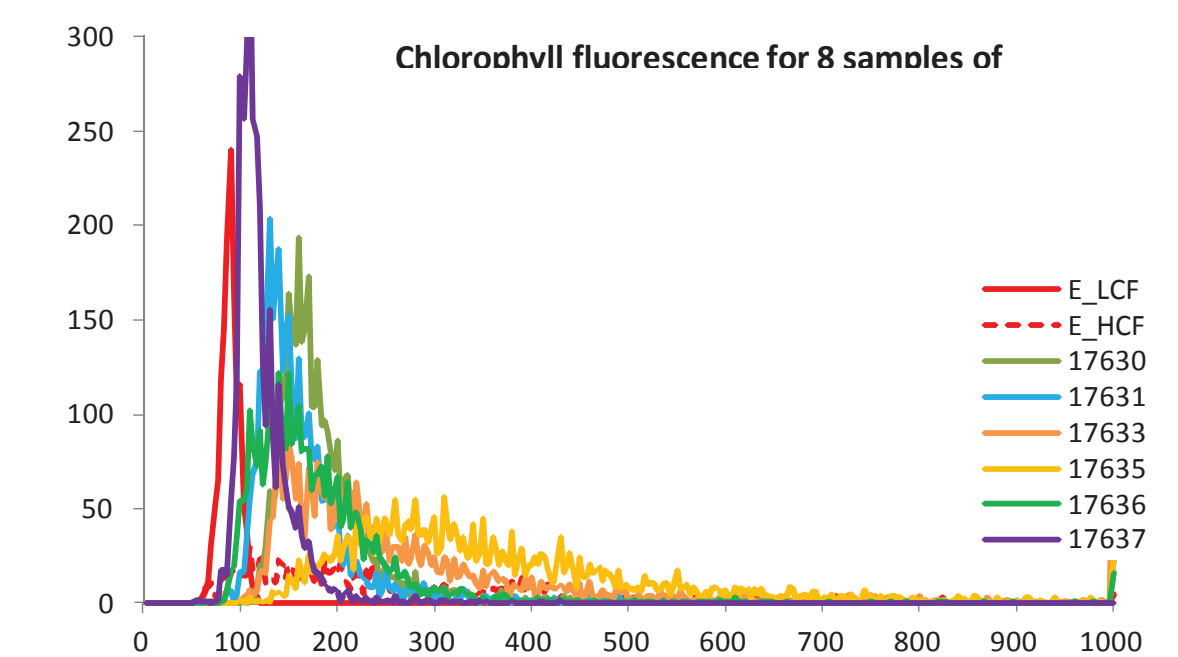


### Seed maturity

Chlorophyll fluorescence  
Seedanalyzer

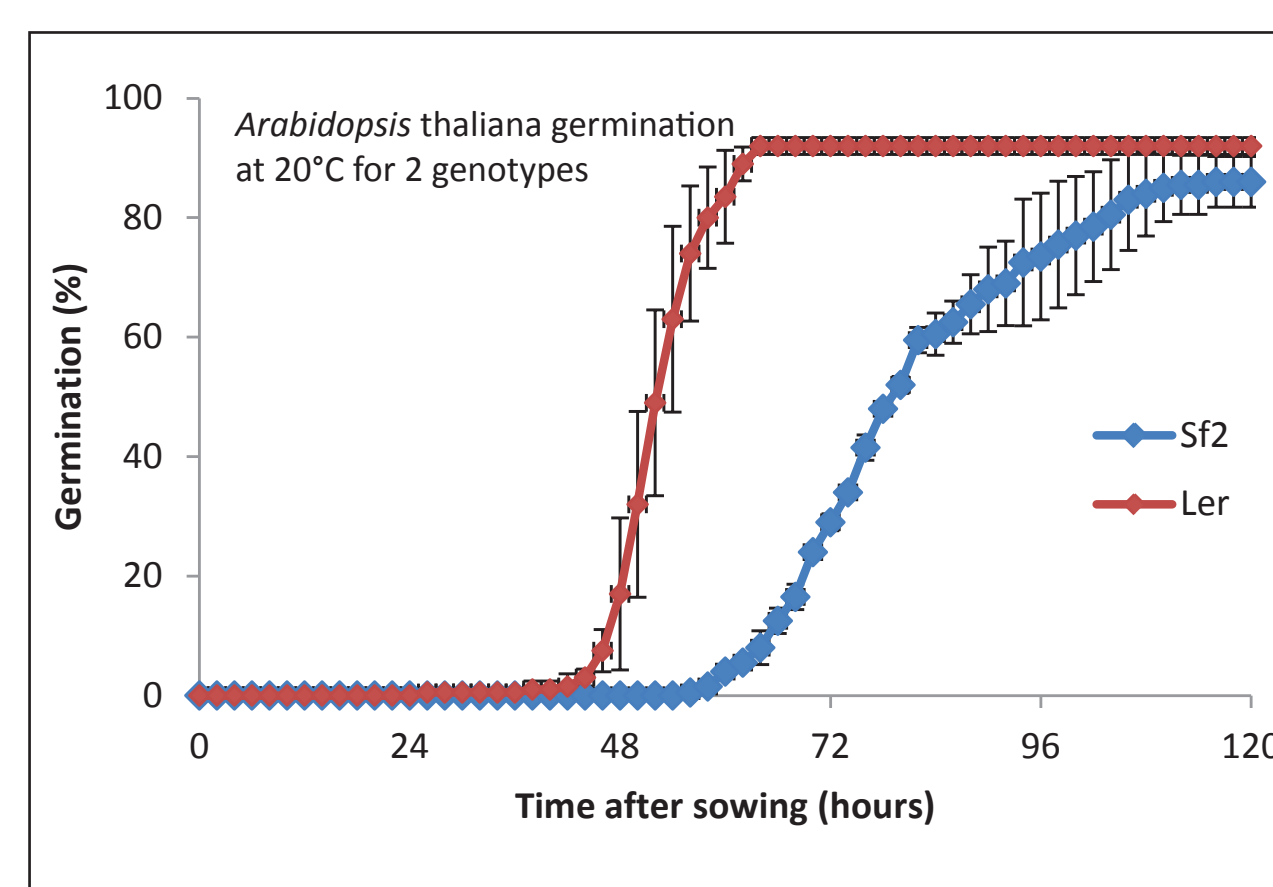
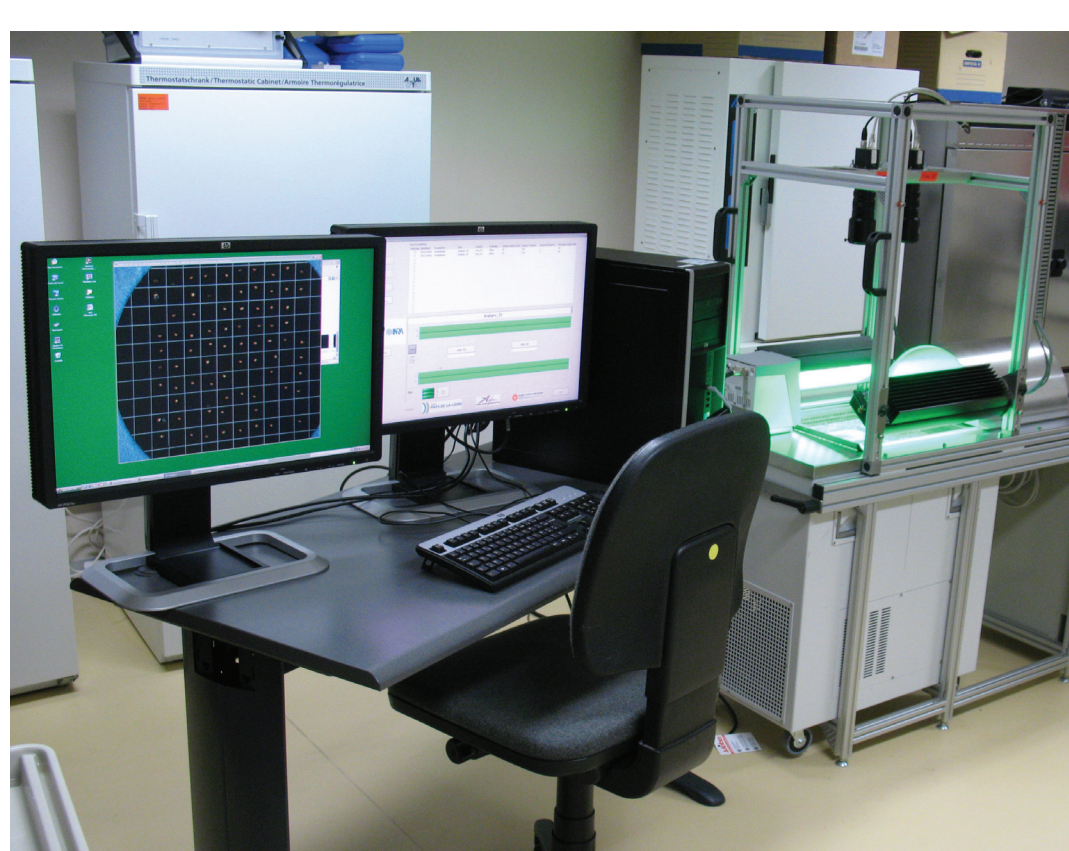
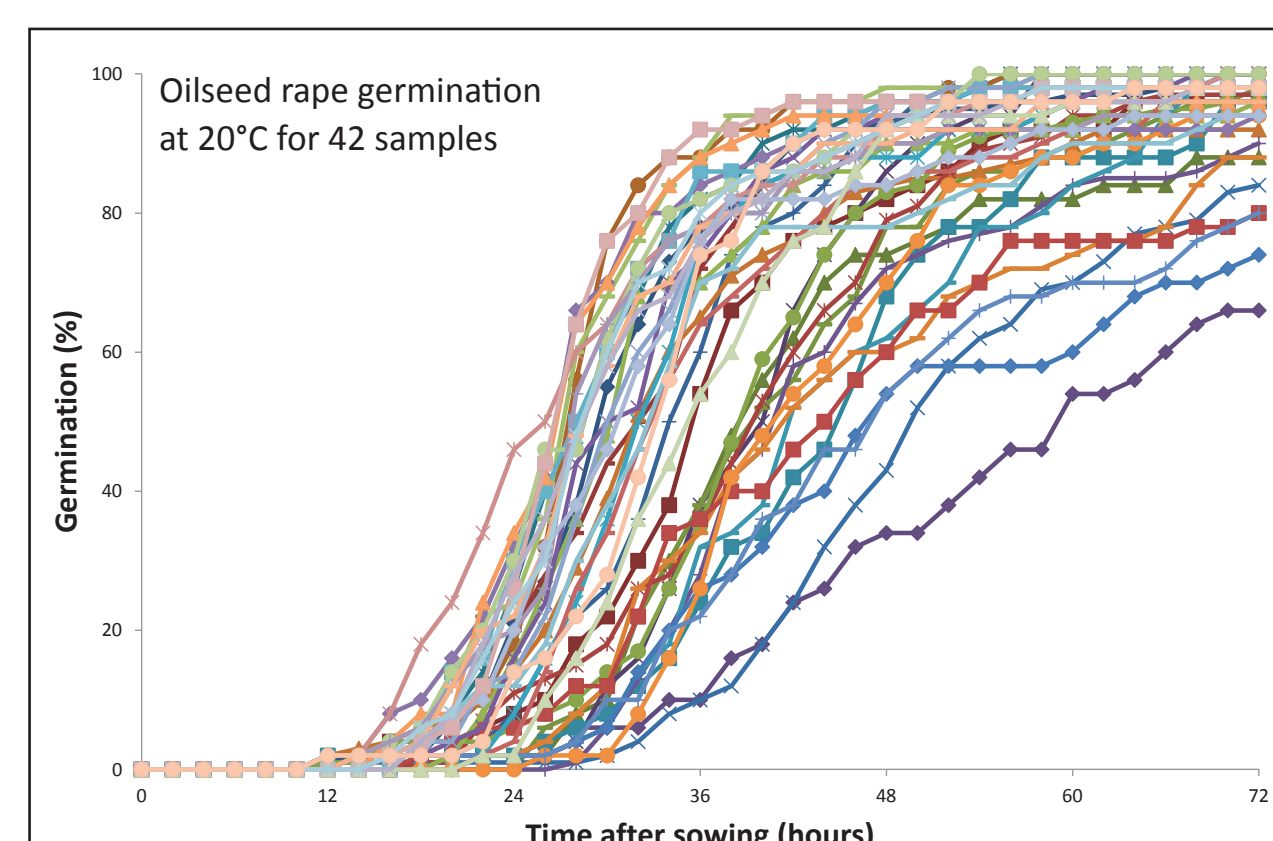
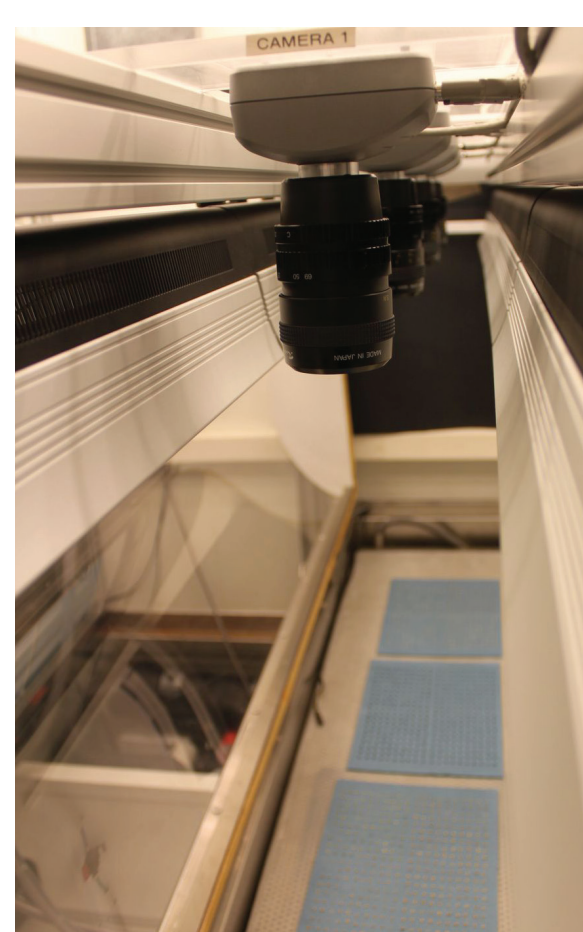
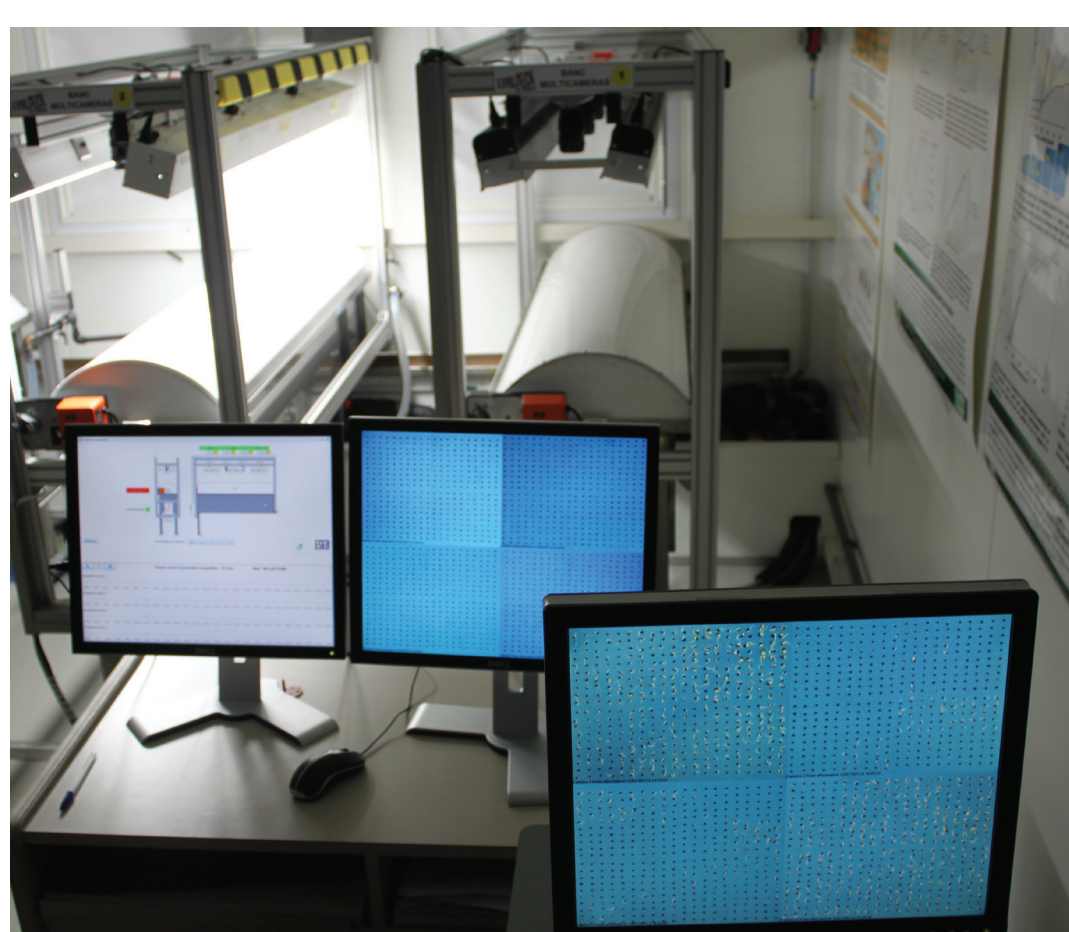


Chlorophyll fluorescence for 8 samples  
of oilseed rape seeds

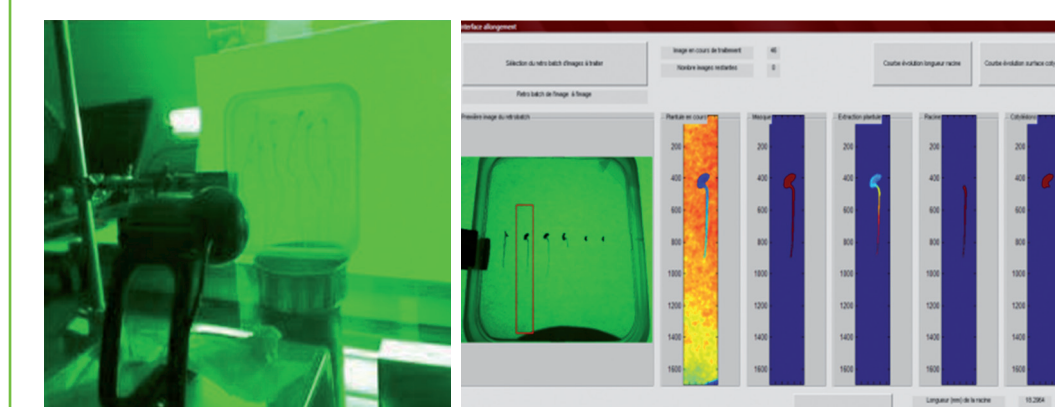


## Automated germination and elongation monitoring

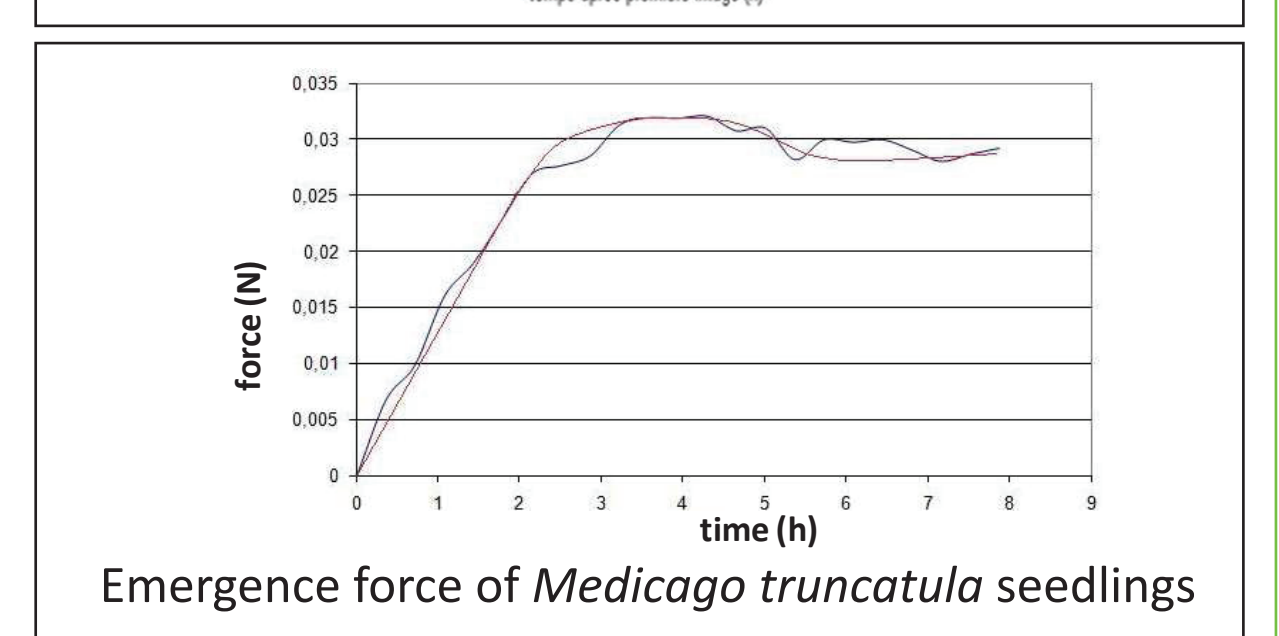
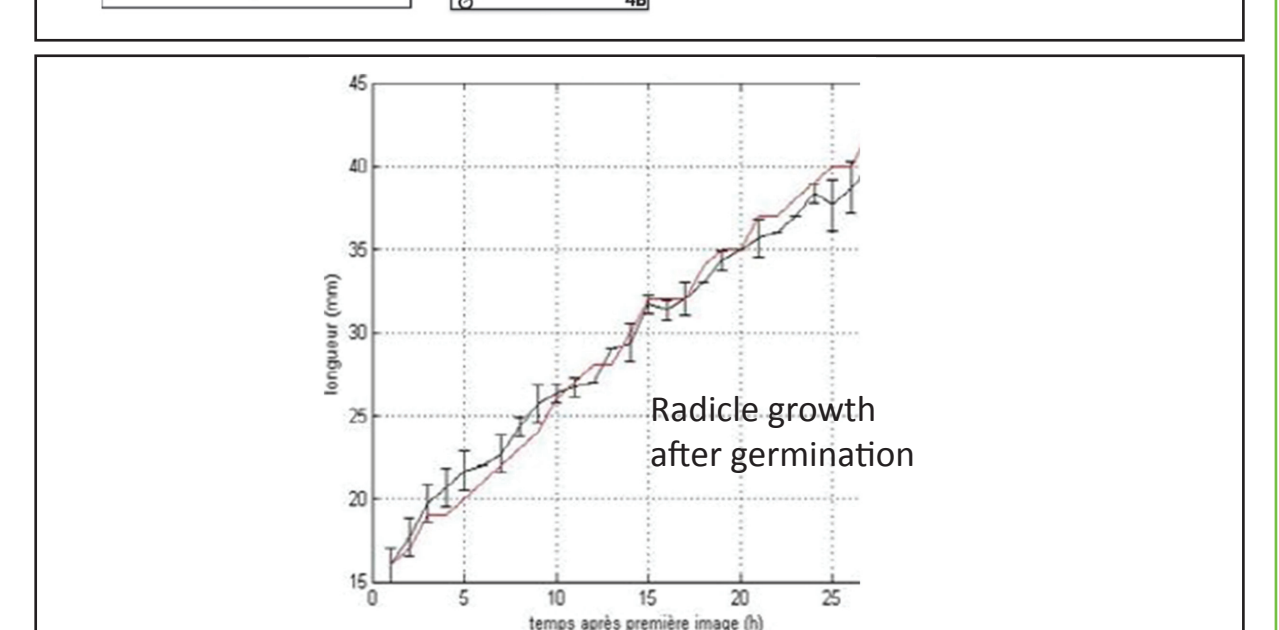
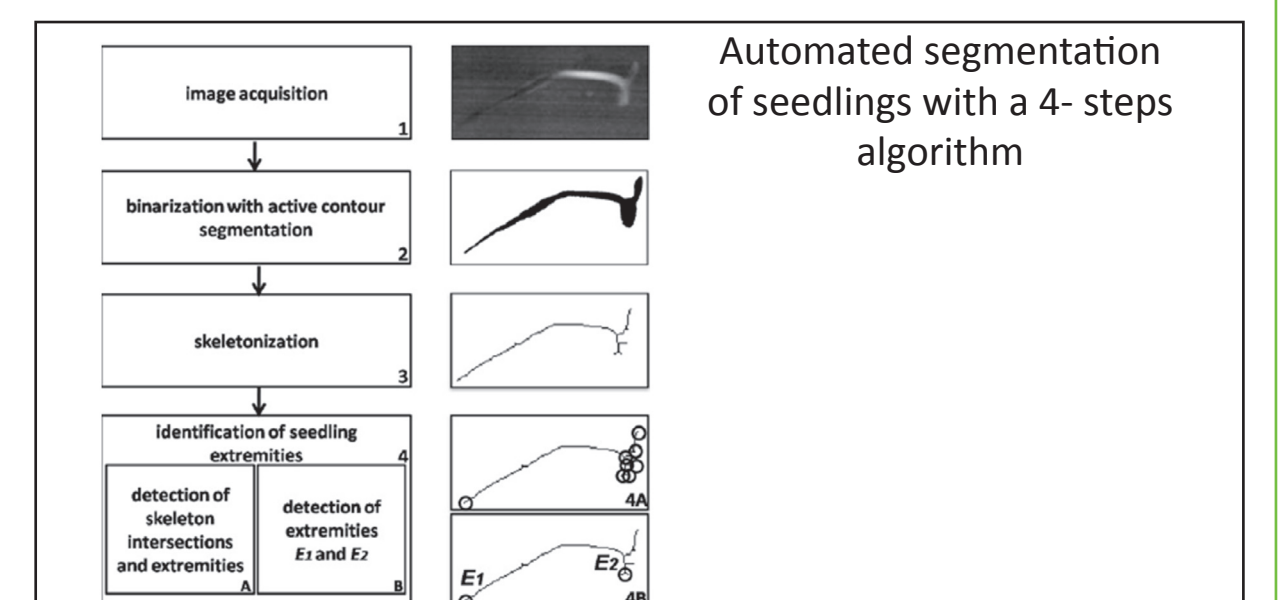
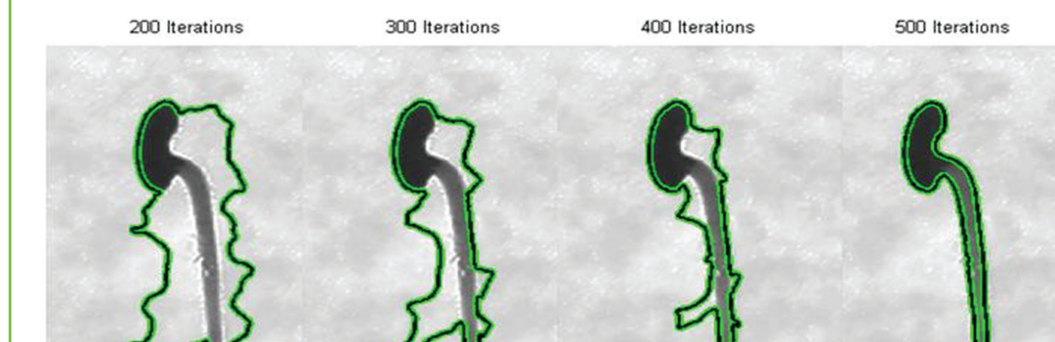
### Germination monitors



### Elongation



Eloncam: measurement of seedling  
elongation tool



## Seed phenotyping in prospective development for seed science and technology

Automated tools allow highthroughput seed phenotyping of interest for:

- seed companies to test seed quality
- biologists to analyze genetic determinism of germination and early plant growth.

Investigating the phenotype by measuring these traits may allow the isolation of underlying loci and their application in seed breeding.

The range of experimental conditions will be extended to lower temperatures or varying water potentials for germination. The capacity will be increased for the elongation system to reach a higher throughput and also for X-ray imaging using X-ray computed tomography. New tools are under investigation as hyperspectral and thermal imaging which are currently developed in collaboration with specialists of signals and image analysis for potential applications in seed testing.