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HELIAPHEN - An outdoor high throughput phenotyping platform

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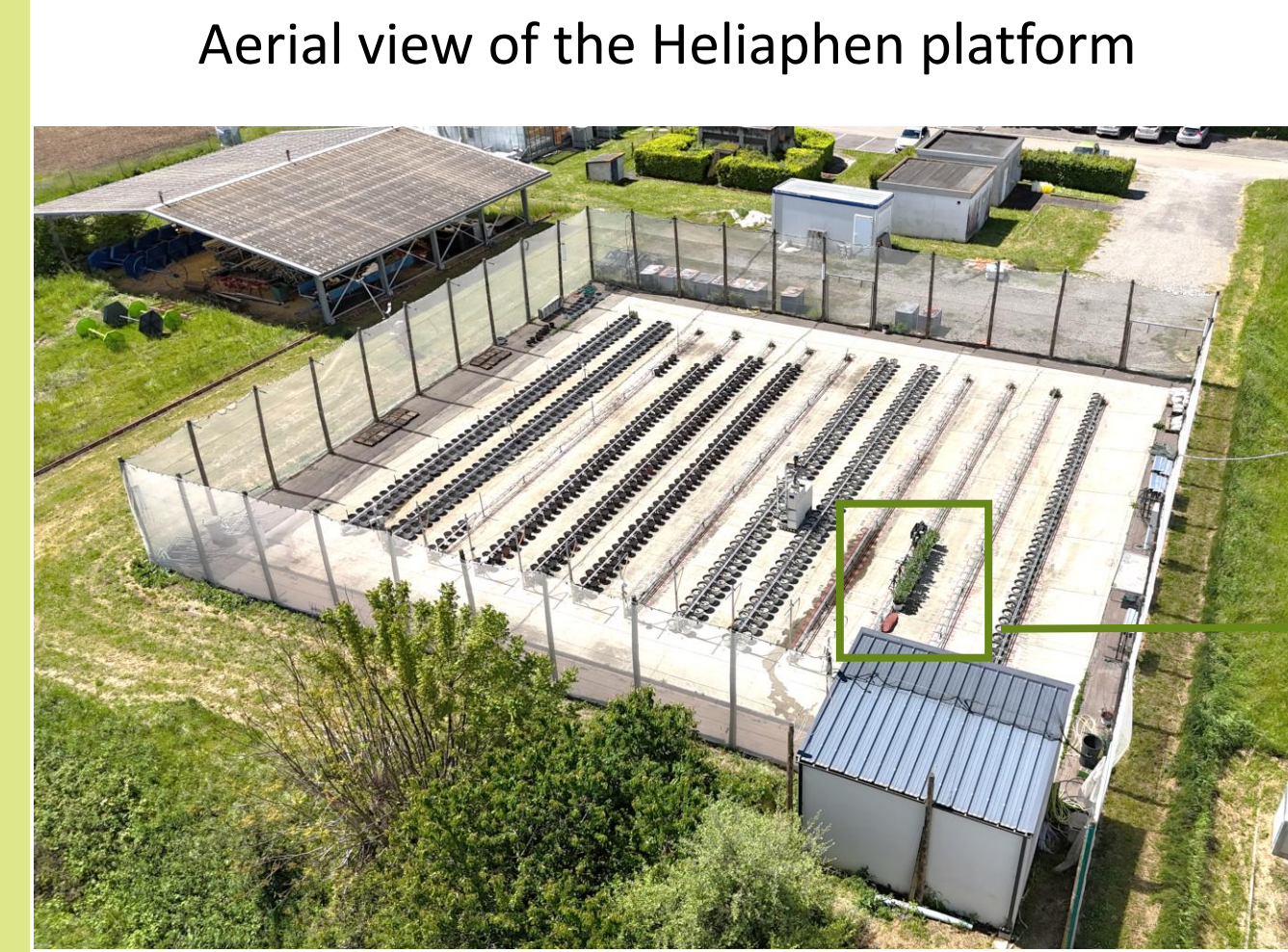
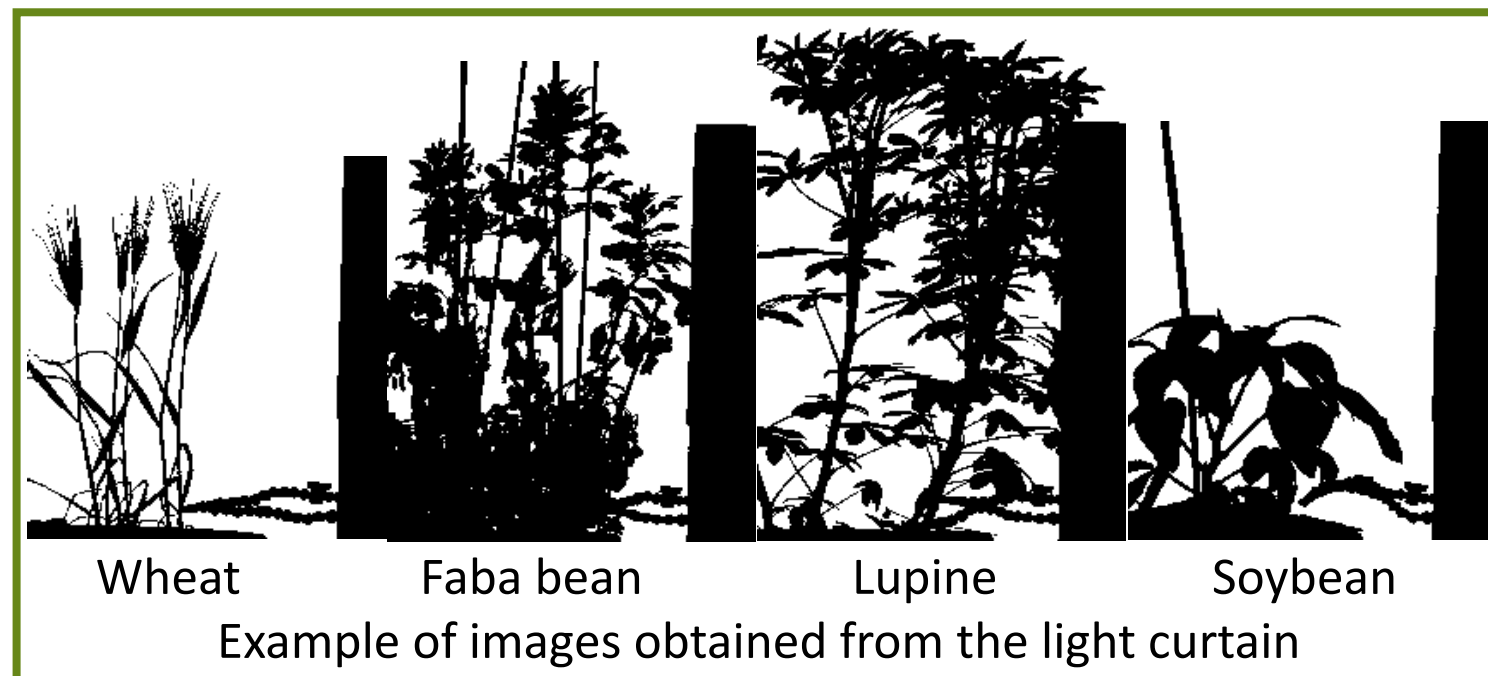
HAL Authorization

An outdoor high throughput phenotyping platform

Heliaphen allows to characterize morphological and physiological plant response to abiotic stresses on large plants. Initially conceived to phenotype responses to controlled drought scenario, we developed new features to implement new scenarios, especially heat stress.

HELIAPHEN general presentation

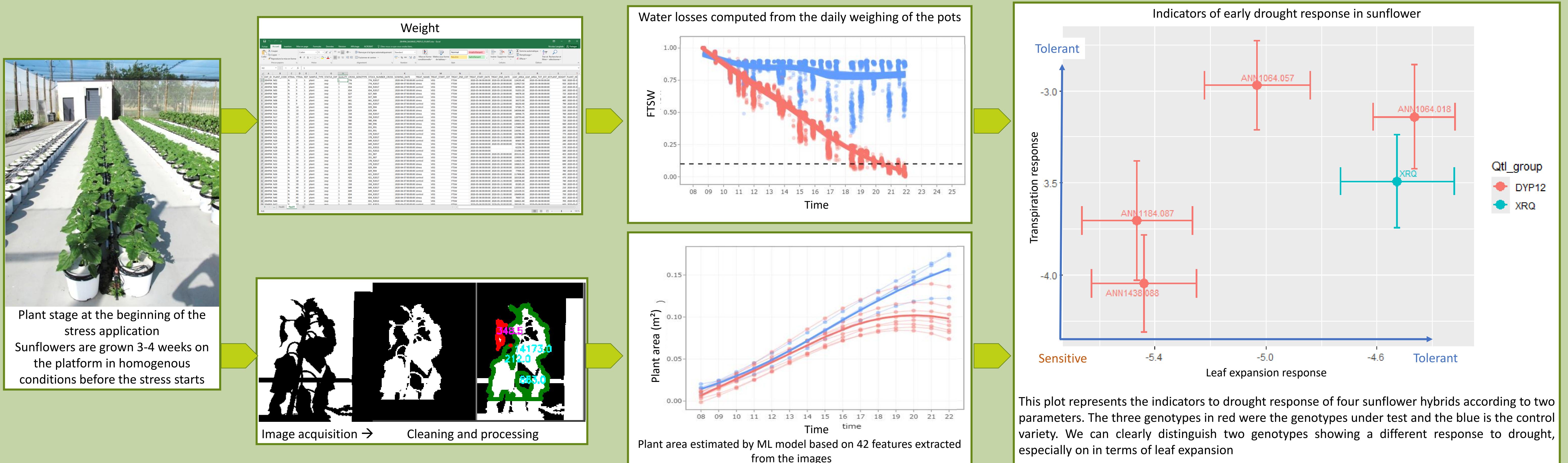
- A 600 m² outdoor platform that can host up to 1300 large volume pots (i.e. up to 15 L)
- Capable to handle up to 2000 pots per year
- The robot comes daily to weight and irrigate plants and implements plant-specific drought scenarios
- Radiant heaters can apply a heat stress on up to 50 plants
- A light curtain for image acquisition
 - These features allow to evaluate plant response in outdoor and natural light conditions, from seedling to full maturity of the plant
 - Tested on different species, e.g. chickpea, fava bean, lentil, soybean, sunflower and wheat



- Robot presentation :
- Autonomous localization and navigation
 - Light curtain for automatic plant growth phenotyping
 - Clamp to catch the pot
 - Balance
 - Tubes for watering

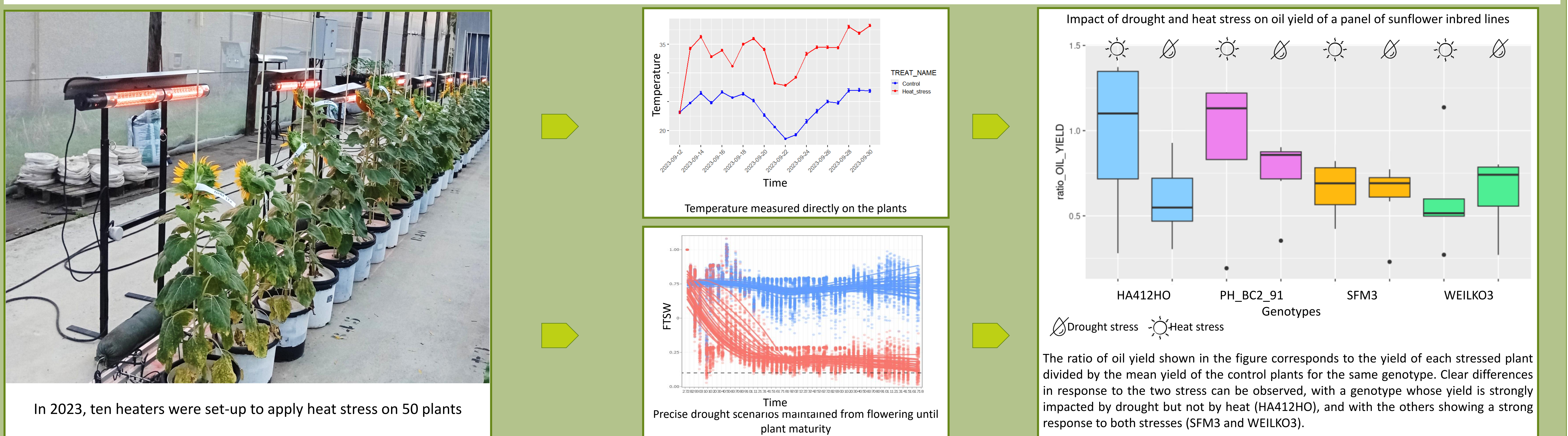
Evaluation of early stage drought response parameters

In this protocol a drought stress is applied during vegetative stress on a set of hybrids. The plant responses to this stress is characterized by two parameters developed for the SUNFLO crop model (Casadebaig et al., 2011 Agric. For. Meteorol.) through leaf expansion and transpiration rate.



Heat stress response

This protocol shows the possibility to apply and maintain drought and/or heat stress over a long period using the robot and radiant heaters in outdoor conditions. The results shown here were obtained on sunflower inbred lines stressed from flowering until full maturity. This allowed to evaluate the impact of these stresses in field-like conditions, with a special focus on the harvest index, and to build a new version of the 'SUNFLO' crop model to validate the genetic bases of stress tolerance in multi-environmental trials.



Collaborations

Many species and diverse protocols has been tested on the Heliaphen platform (including cold and salinity stress). For more information contact: Nicolas Langlade (nicolas.langlade@inrae.fr) or Nicolas Blanchet (nicolas.blanchet@inrae.fr)



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