

GENETIC VARIATION OF WHEAT SEEDLING ROOT ANGLE

C. COLLET, B. MOTTOULLE, T. DAGBERT, G. LOBET AND X. DRAYE

EARTH AND LIFE INSTITUTE, UNIVERSITÉ CATHOLIQUE DE LOUVAIN, BELGIUM. CONTACT: clothilde.collet@uclouvain.be

BELOW-GROUND PARTS OF PLANTS, OUR KEY PLAYERS !

Below-ground parts of plants play a significant role in water and nitrogen extraction, and adaptation to changing environments.

Seminal root angles of cereal seedlings are good predictors of top soil exploration during crop establishment.

Knowing the variability and heritability of root angle is a preliminary step towards improvement of seedling root architecture.



This research is part of the European project [SolACE](#) :

- Two diversity panels (bread wheat panel and durum wheat panel) for association genetics.
- Advanced phenotyping experiments in equipped fields and controlled conditions platforms.
- Emphasis on a combined deficit of water and nitrogen.

→ 2 experiments presented here as part of SolACE project.

SEMINAL ROOT ANGLE EXPERIMENT

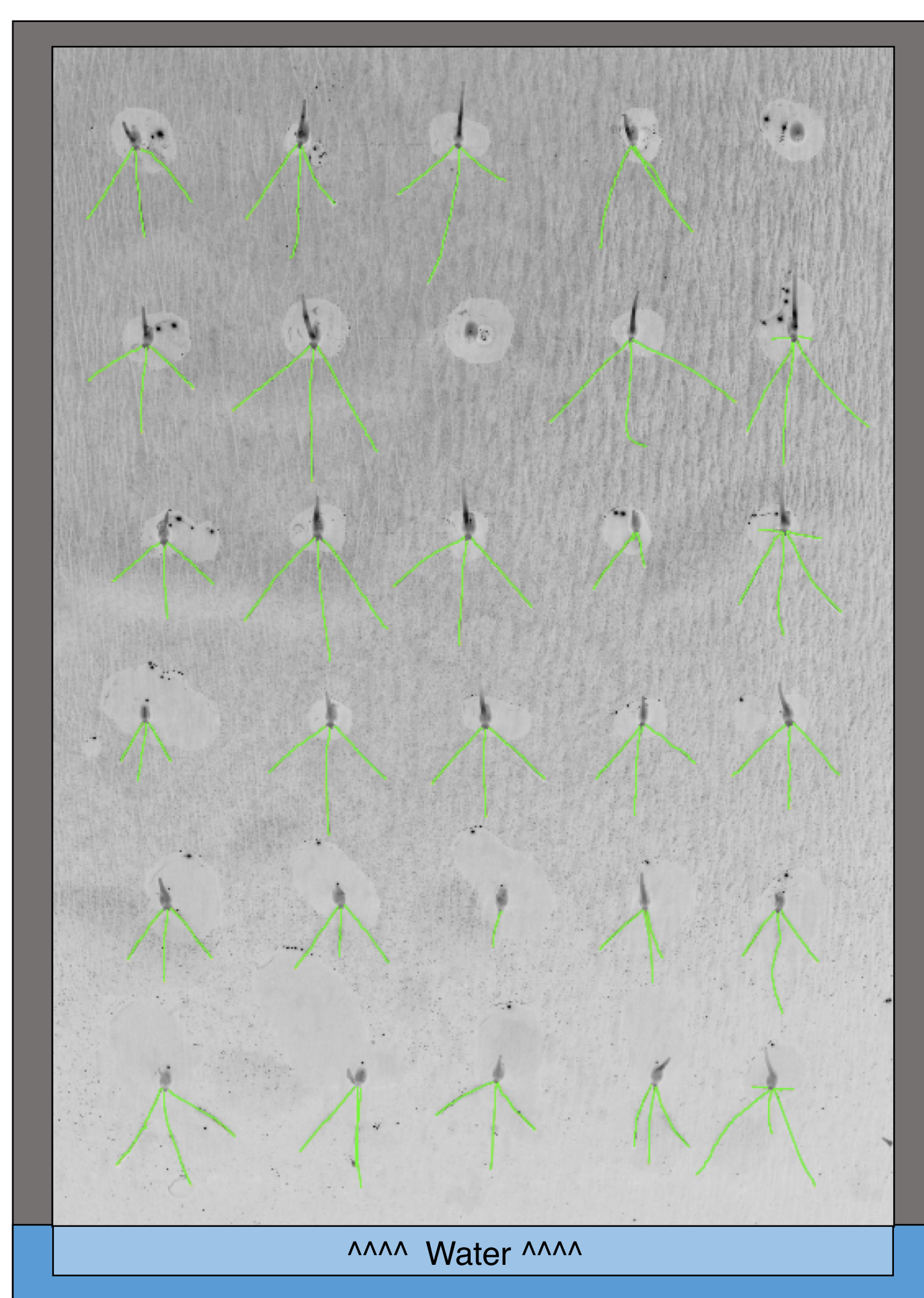
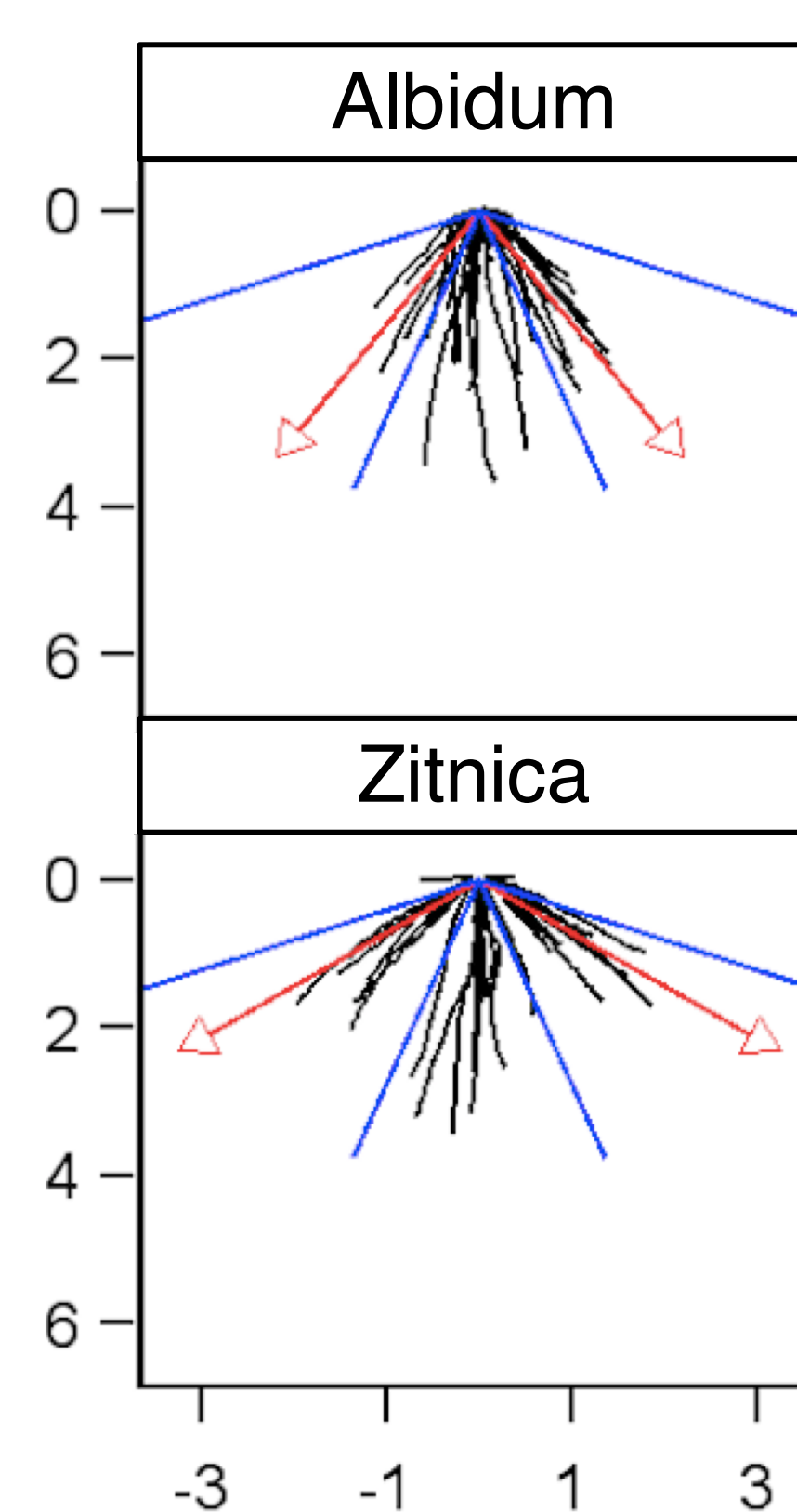
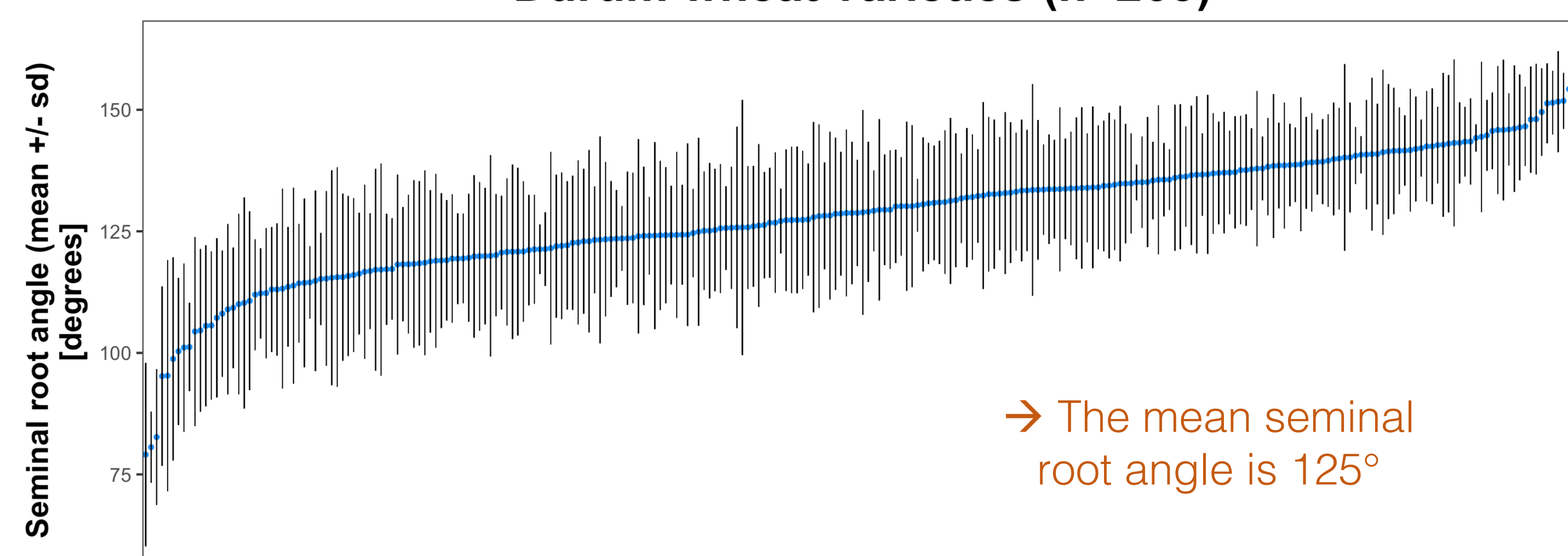


Illustration of extreme bread wheat varieties



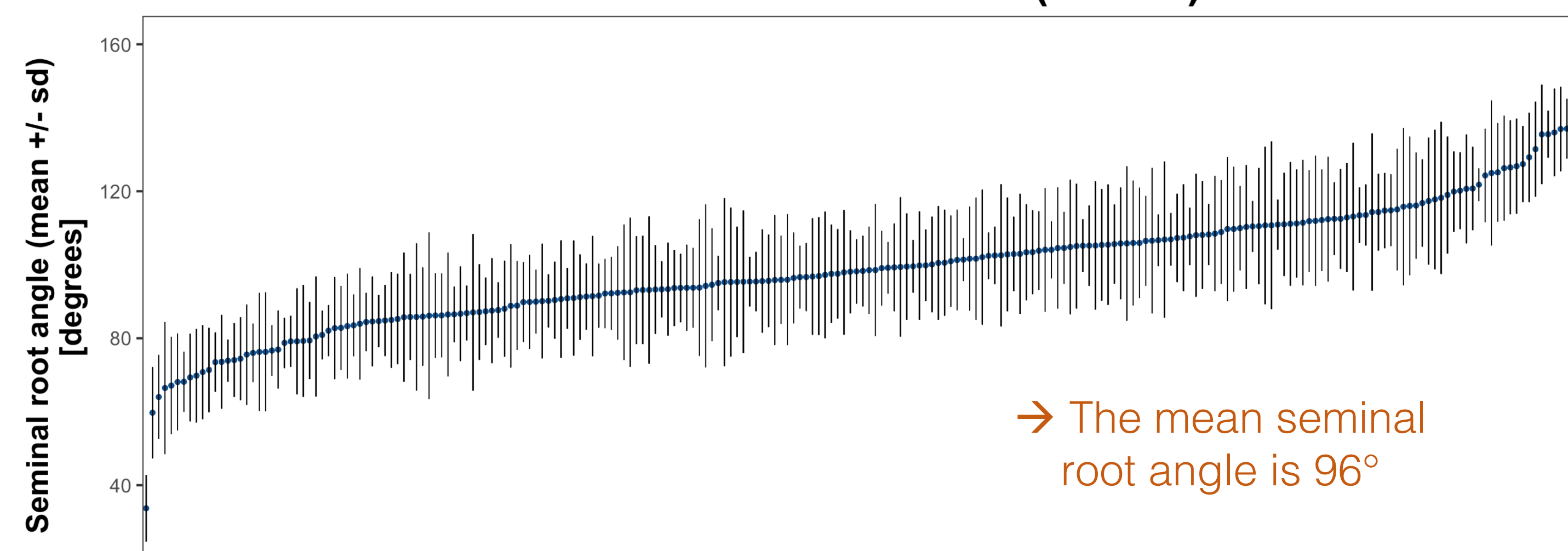
Seedlings growing at different matric potentials (height above the water level) displayed a significant root angle plasticity in the two panels, despite the very small amplitude of potential (25 cm). This plasticity is genetically variable only in bread wheat.

Durum wheat varieties (n=263)



→ The mean seminal root angle is 125°

Bread wheat varieties (n=229)



→ The mean seminal root angle is 96°

Very high broadsense heritability for the root angle in both species = 0,82.

PHENOTYPING ROOT GROWTH DYNAMICS



RootPhAir :

- Aeroponics.
- High throughput phenotyping.
- Time-lapse image sequences with 2h resolution.
- Affordable and non-invasive technique.

Identification and tracking of root tips in image sequences :

- Root growth rate.
- Emergence.
- Maximum length.
- Apical diameter.

CONCLUSIONS & PERSPECTIVES

Seminal root angle experiment :

- The large heritability of root angle suggests QTLs will be detected.
- Wheat seminal root angle responds to small differences of water deficit.
- In bread wheat, this response is genotype-dependent and may lead to unexplored adaptation possibilities.

Other data sources will be mobilised :

- Aeroponics (RootPhAir) : dynamic root traits.
- 4PMI platform (INRA Dijon).
- Field data (Syngenta, Arvalis, INRA).

Further analyses :

- Characterisation of genetic determinism for the root traits.

