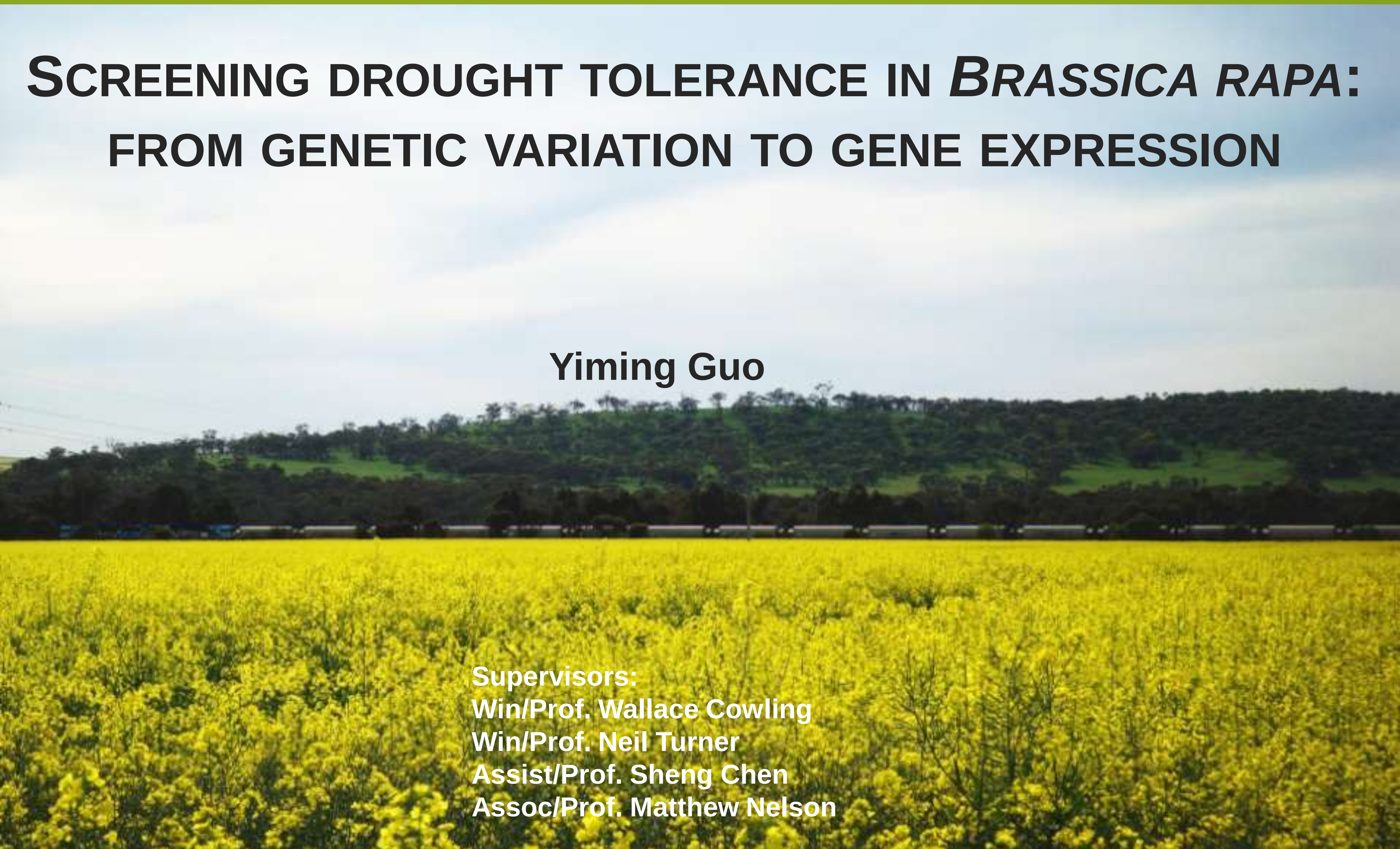
The University of Western Australia

School of Plant Biology & The UWA Institute of Agriculture



Screening drought tolerance in *Brassica rapa*: from genetic variation to gene expression

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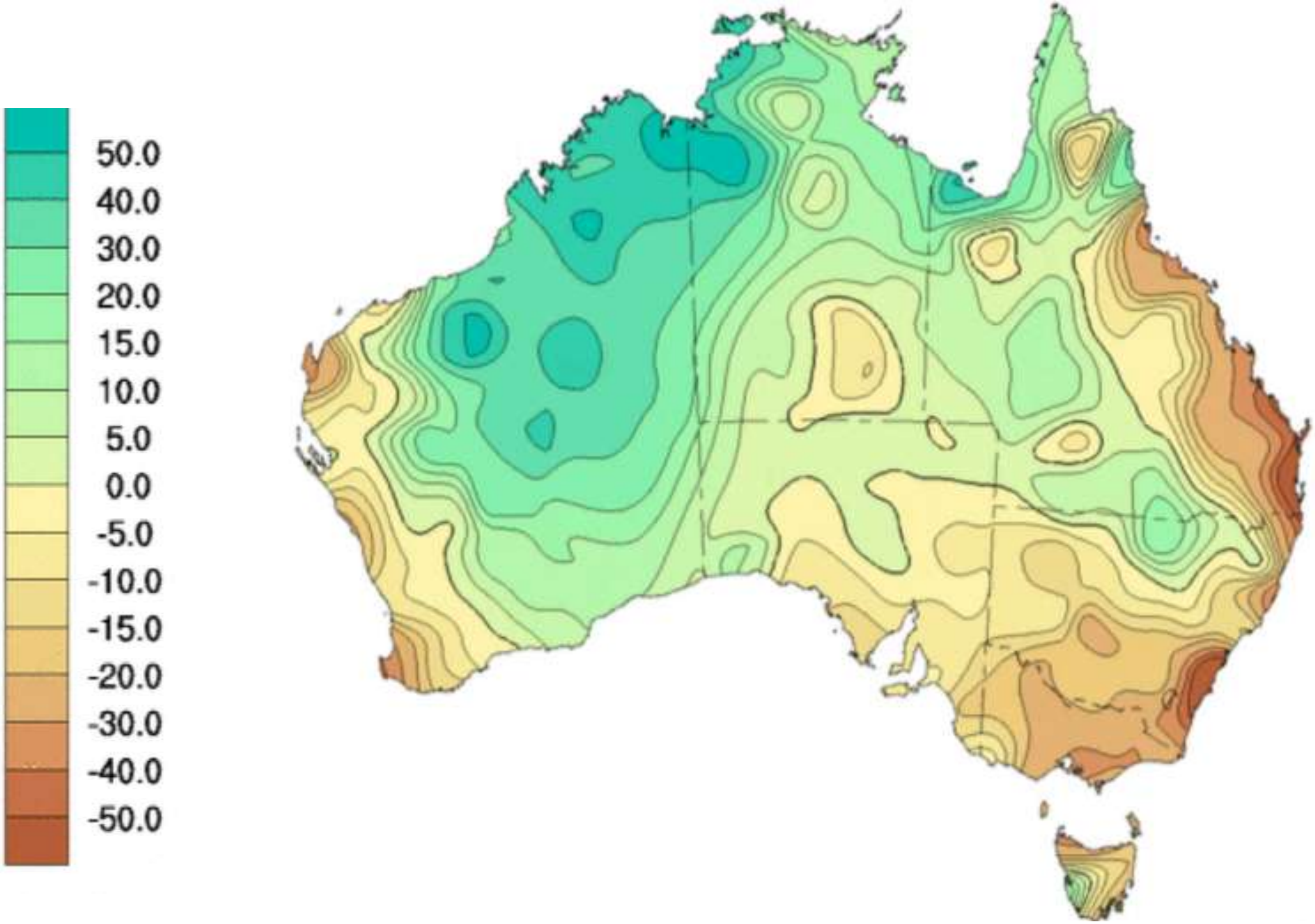
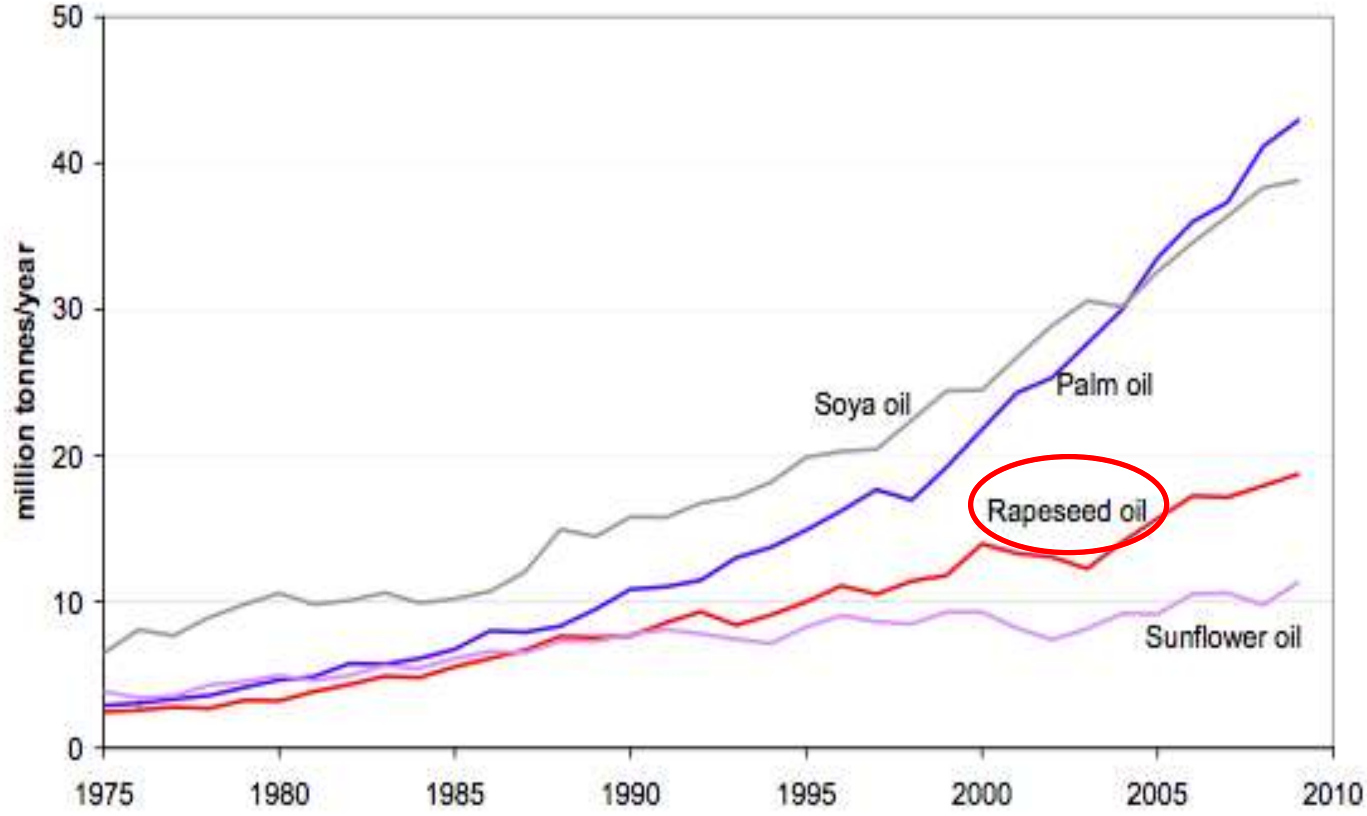
Win/Prof. Neil Turner
Assist/Prof. Sheng Chen
Assoc/Prof. Matthew Nelson

Trend in annual rainfall 1960-2009 (mm per decade)



CSIRO and Bureau of Meteorology-- State of the Climate

Growing demand for edible oils



Annual growth of major edible oils production (palm, rapeseed, soy and sunflower oils)

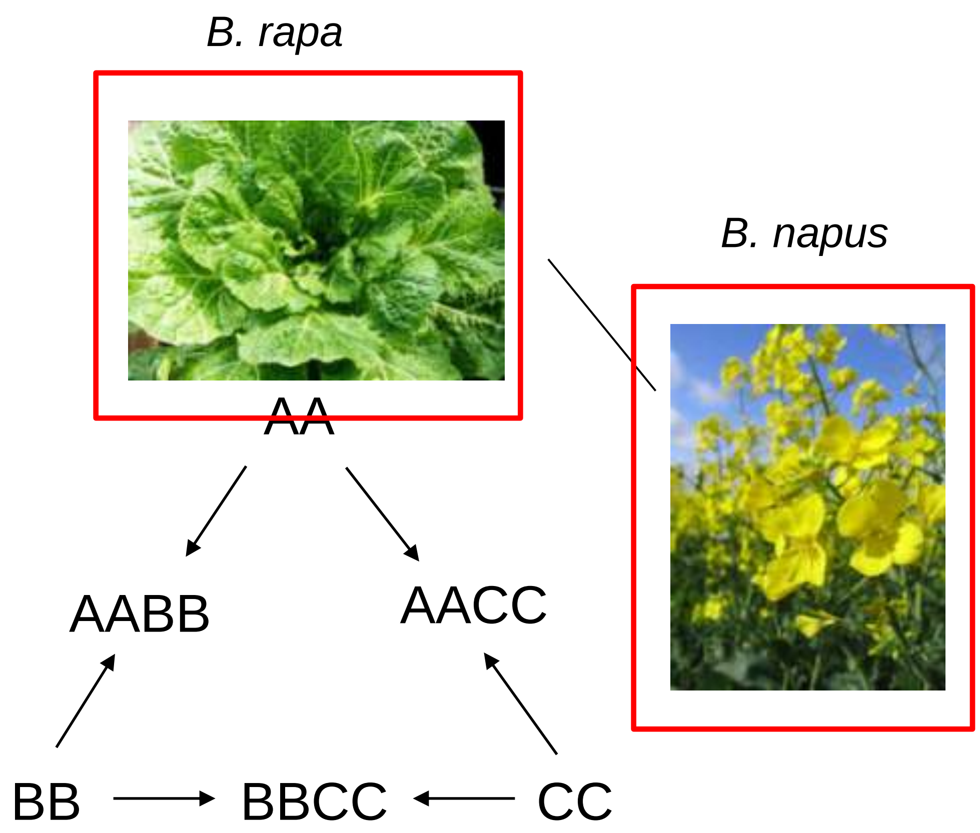
Source: www.fas.usda.gov/psdonline

Why *Brassica rapa*?

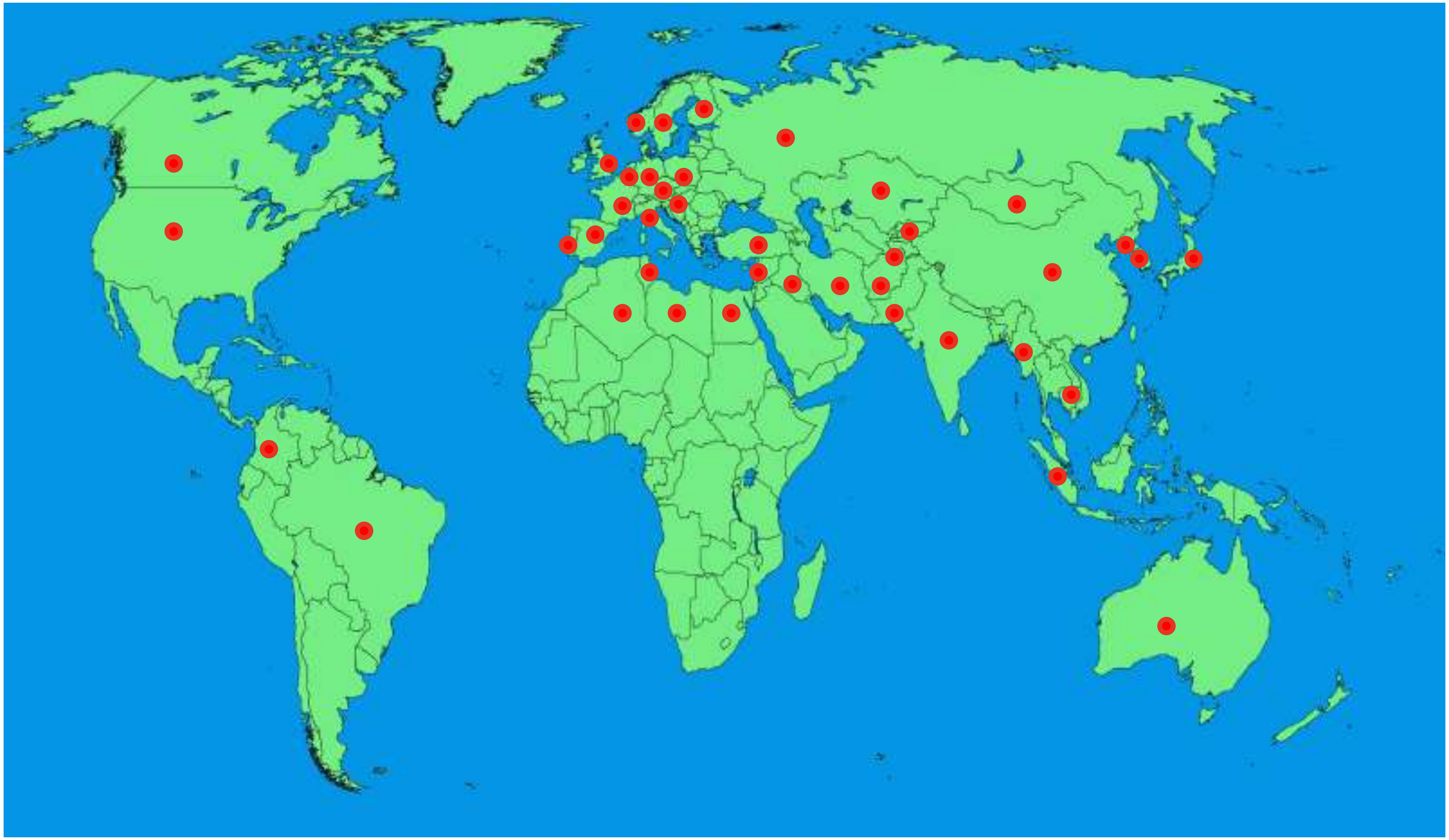
❖ A diverse

U's Triangle

❖ **One of the ancestor species of *B. napus* (canola)**



Step 1. Sources of genetic diversity

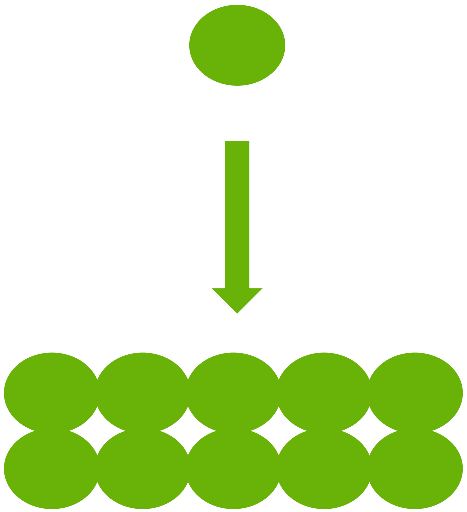


173 accessions from 44 different geographical regions

Guo YM *et al* (2014), *Journal of Heredity,* **105**:555-565

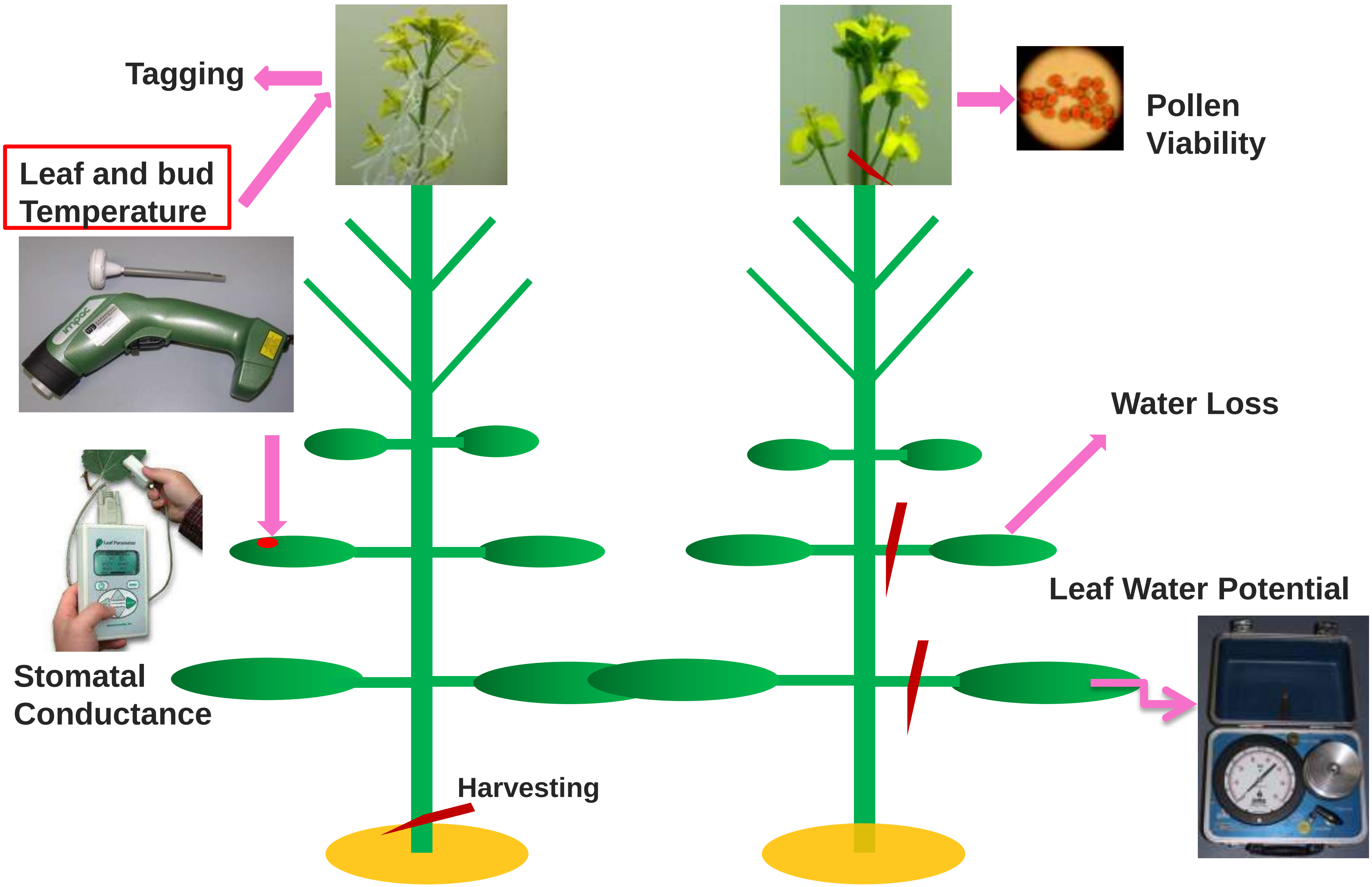
Step 2. Develop a drought screening protocol in *B. rapa*

- ❑ Started from one accession
- ❑ Evaluation of drought responses
- ❑ Expand method to ten accessions

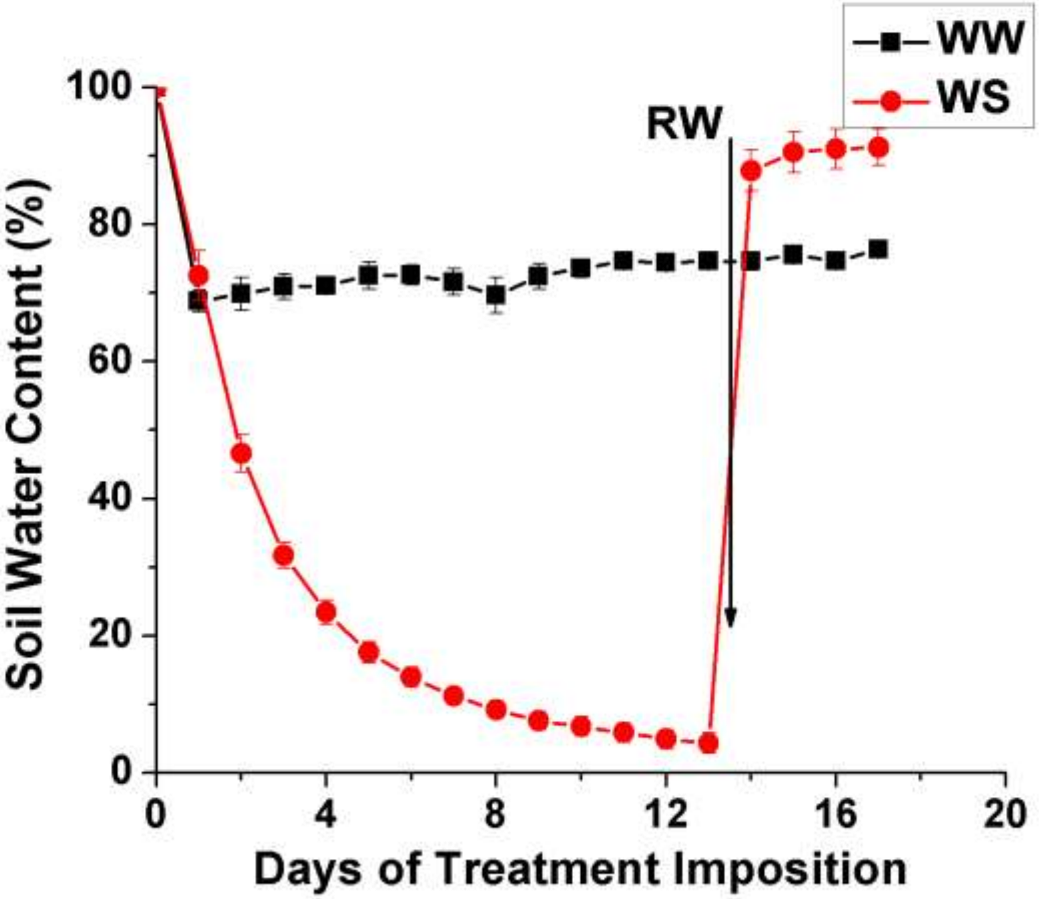


- Target at flowering stage
- Controlled environment room for treatment
- Water-stressed (WS) *vs* well-watered (WW)

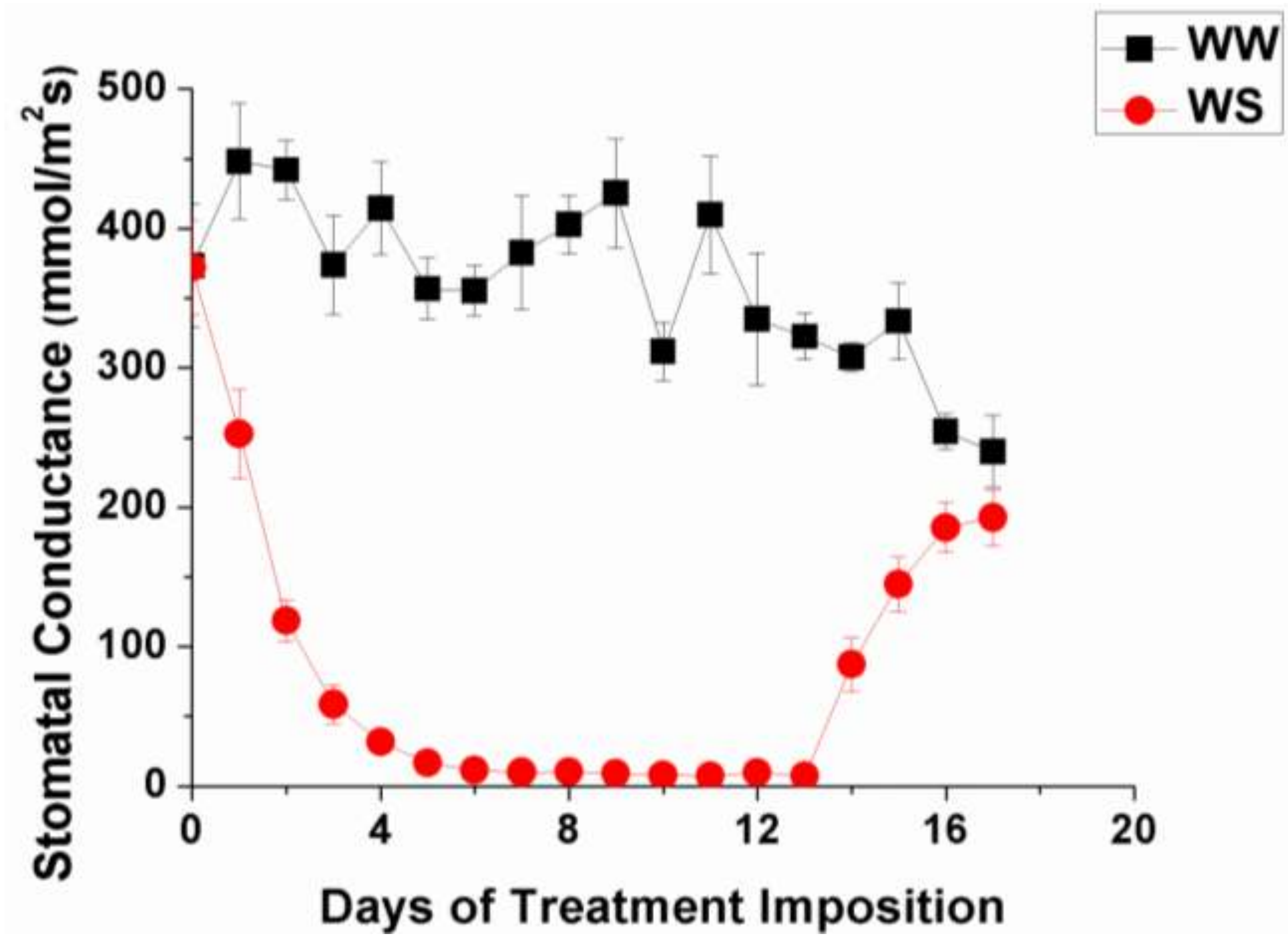
Controlled room at flowering for treatment


Tagging
Leaf and bud Temperature
Pollen Viability
Water Loss
Leaf Water Potential
Stomatal Conductance
Harvesting

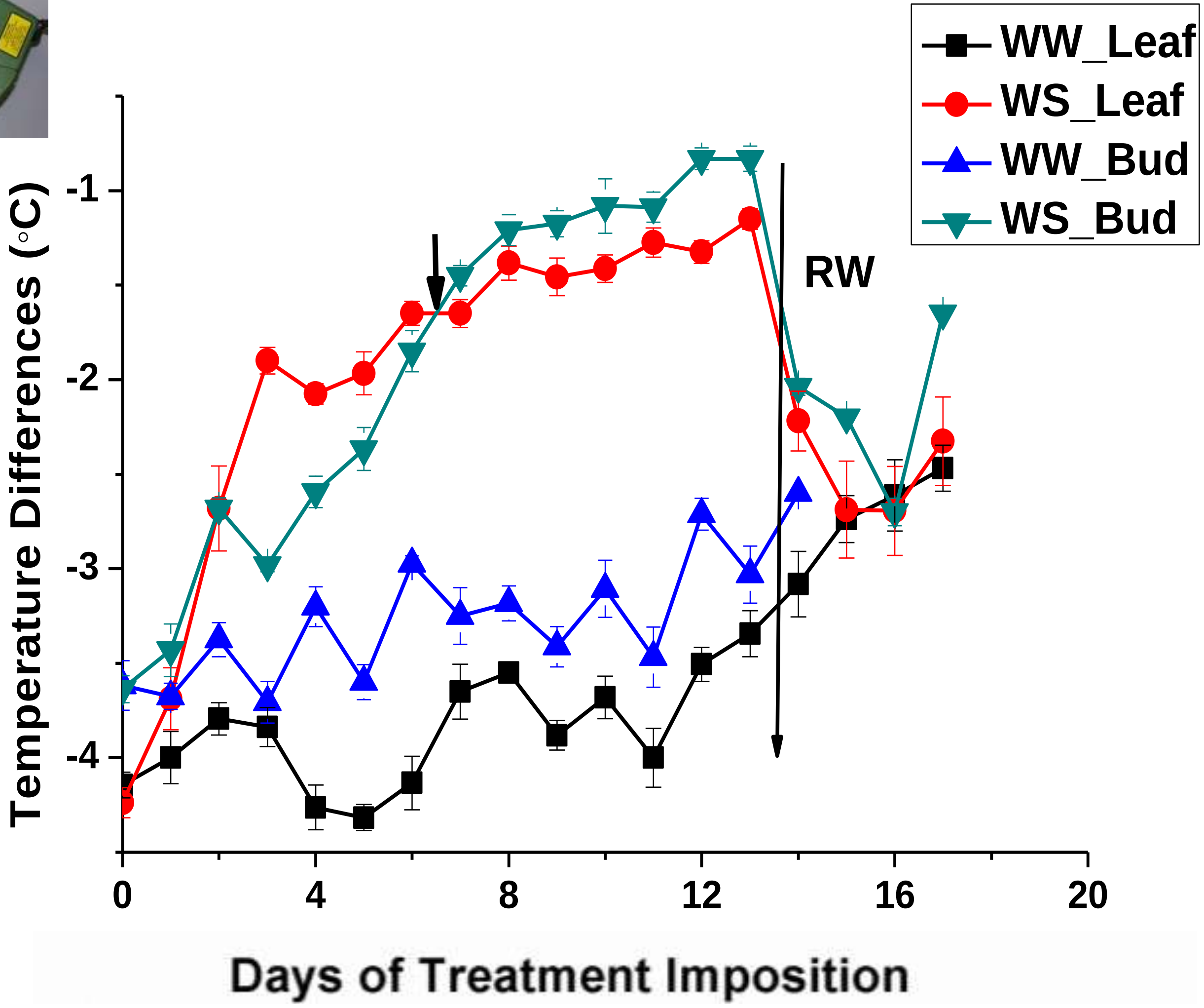
Soil Water Content (%) in WS and WW treatments



Leaf stomatal conductance in WS and WW treatments

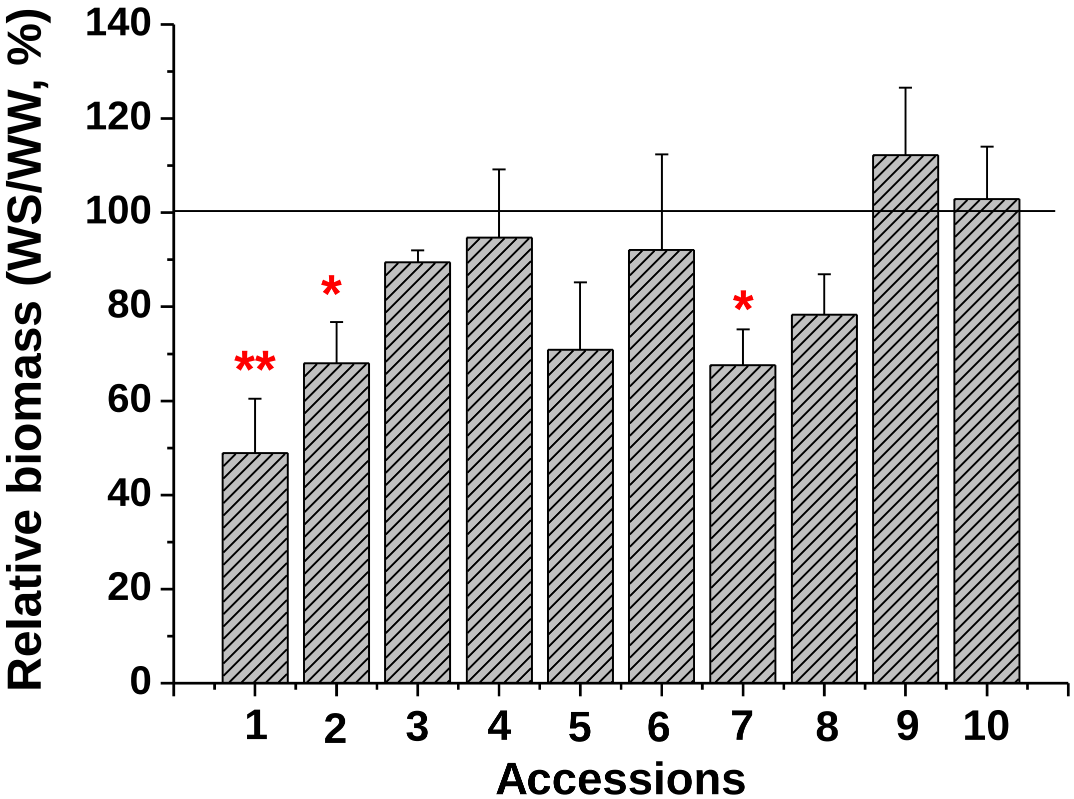


Leaf and bud temperatures in WS and WW treatments

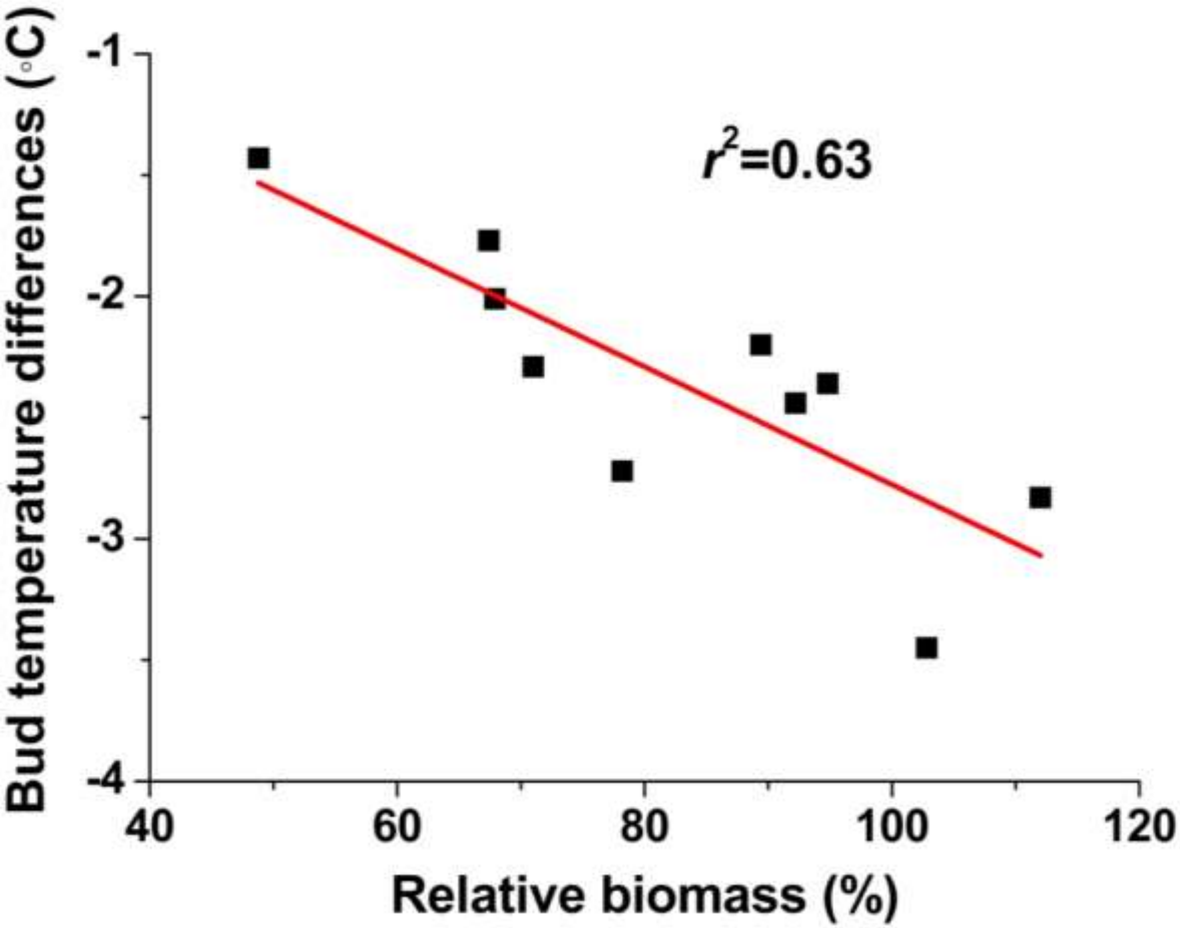


Genotypic variation for total biomass in WS *vs* WW (WS/WW, %)

Genotypes vary in relative total biomass at maturity

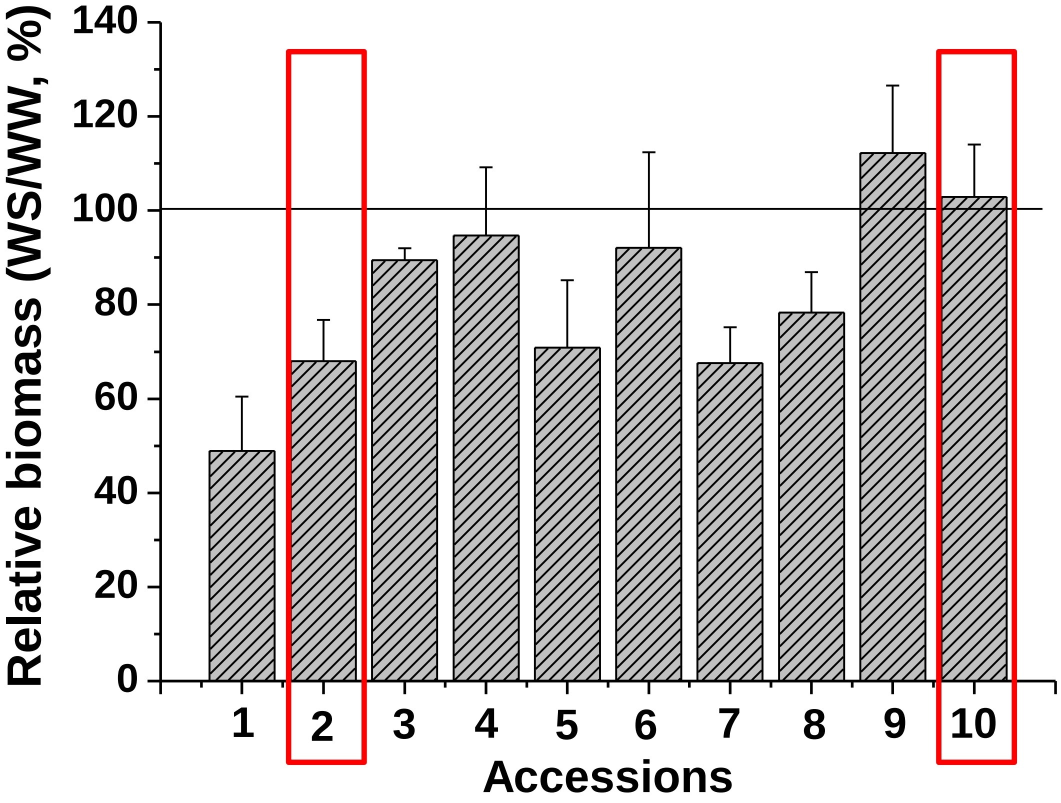


Cooler buds during drought stress associated with greater relative biomass at maturity



Step 3. Identifying drought related genes

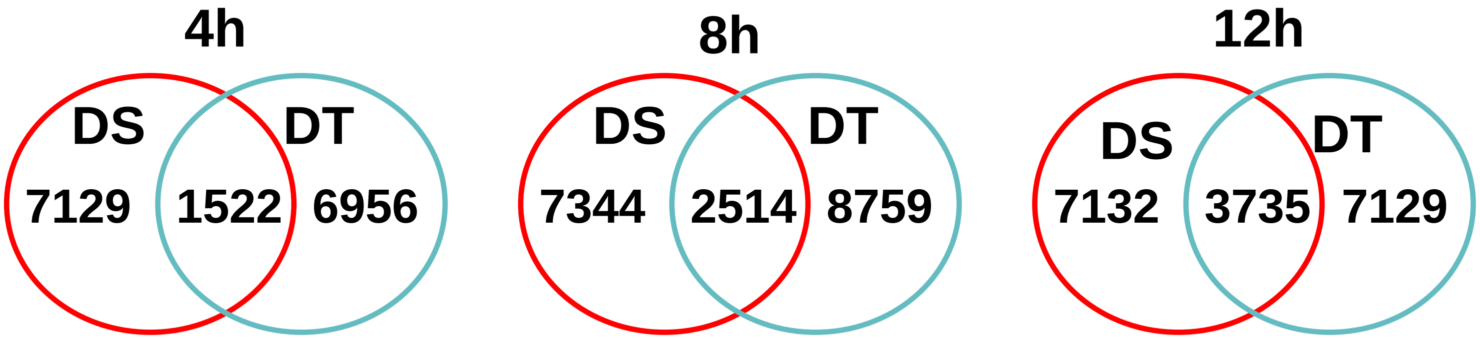
❑ Two accessions were selected with contrasting responses from Step 2



- ❑ **PEG vs MS control**
  in both drought-tolerant (DT) and drought-se

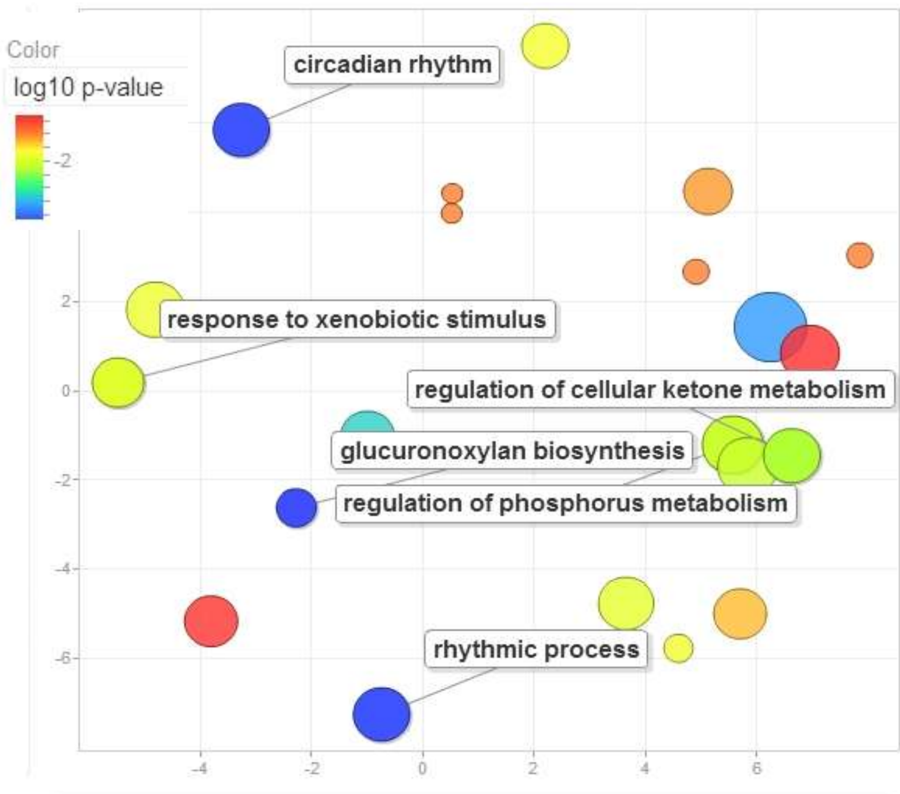
- ❑ **Samples were taken 4h, 8h and 12h after st**

- ❑ **RNA sequencing**

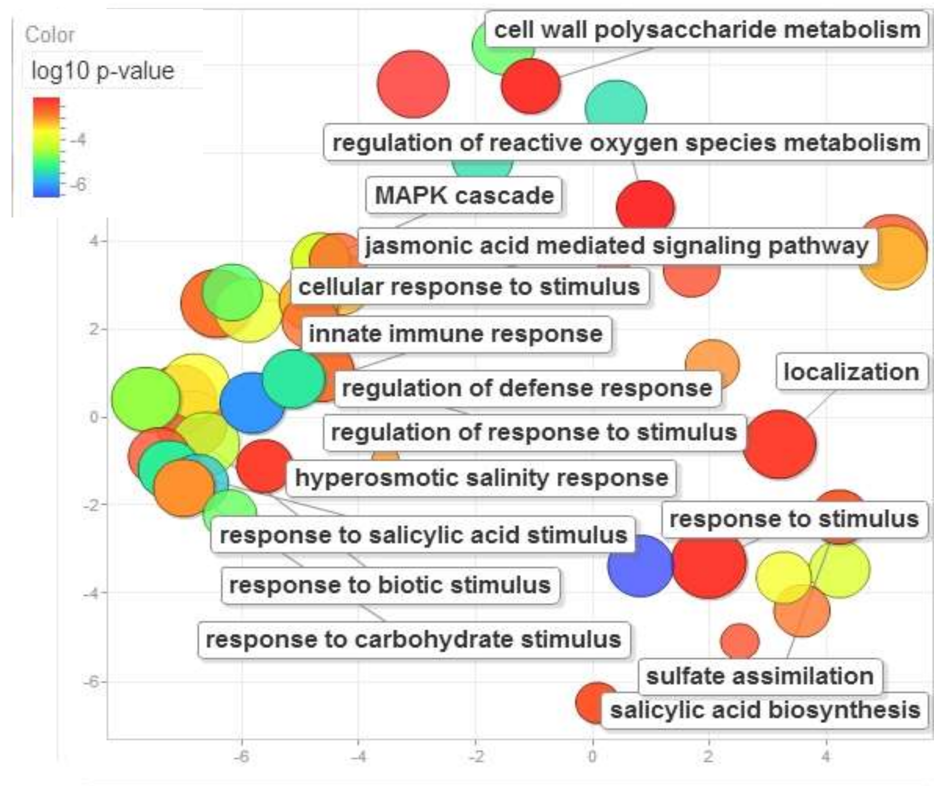


17,227 differentially expressed genes were identified

4h after stress application



Drought-sensitive



Drought-tolerant

P<0.01

Methods: Supek F et al (2011), Plos one, journal.pone.0021800

Brief Summary

- **Genetic diversity was important for screening drought tolerance**
- **Some accessions coped with drought better than other with more biomass**
- **Accessions with cool floral bud temperatures had high final biomass – a potentially useful drought screening tool for breeders?**
- **Quicker drought-related pathways were regulated in tolerant line – potential useful genes for further investigation?**

Acknowledgements

Supervisors and advisors：

Winth/Prof. Wallace Cowling；Winth/Prof. Neil Turner

Assist/Prof. Sheng Chen；Assoc/Prof. Matthew Nelson

Prof. Rod Snowdon; Hackett Prof Kadambot Siddique

Funding:

China Scholarship Council and UWA Sir Eric Smart Scholarship

ARC Linkage Project LP110100341

Norddeutsche Pflanzenzucht Lembke AG (NPZ)

Council of Grower Group Organisations Ltd (COGGO)

Seed sources:

Australia Temperate Field Crops Collection (ATFCC)

Huazhong Agricultural University (HZAU)

Norddeutsche Pflanzenzucht Lembke AG (NPZ)

The Leibniz Institute of Plant Genetics and Crop Plant Research (IPK)

Technical support:

School of Plant Biology, UWA, Australia

Plant Breeding Institute, Justus Liebig University, Giessen, Germany

Thank You