

USING PHENOARCH PLATFORM TO DISSECT THE GENETIC AND PHYSIOLOGICAL CONTROL OF GROWTH AND WATER USE RESPONSE TO DROUGHT OF AFRICAN SORGHUM

Summary

From August to October 2017, a trial was conducted on the Phenoarch platform (LEPSE, INRA Montpellier, France). 196 different African Sorghum accessions were planted in two water treatments (four replicates per accession for each treatment, resulting in 1568 plants). High-throughput Phenotyping focused on plant growth, architecture, water use, and biomass.

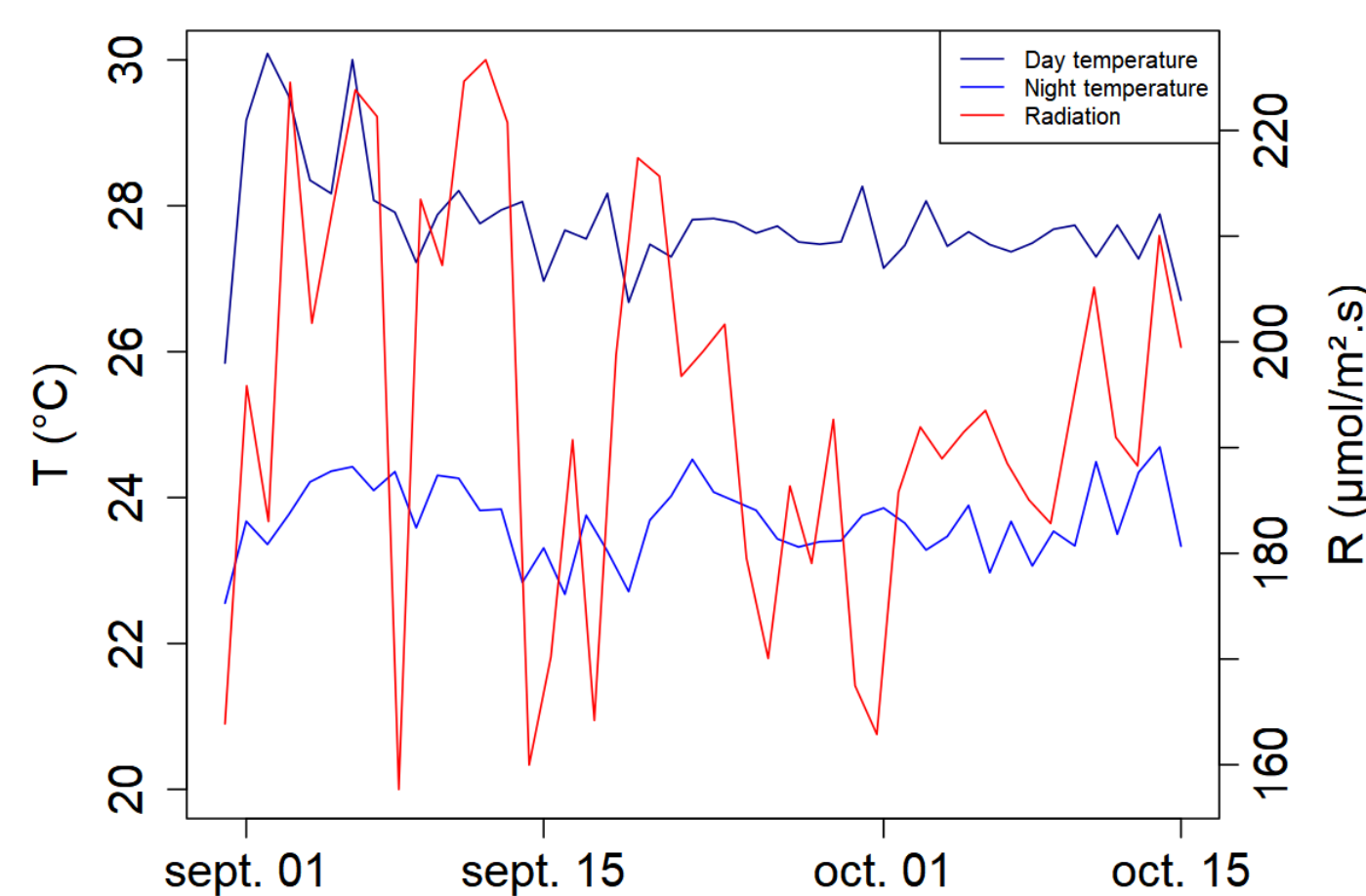
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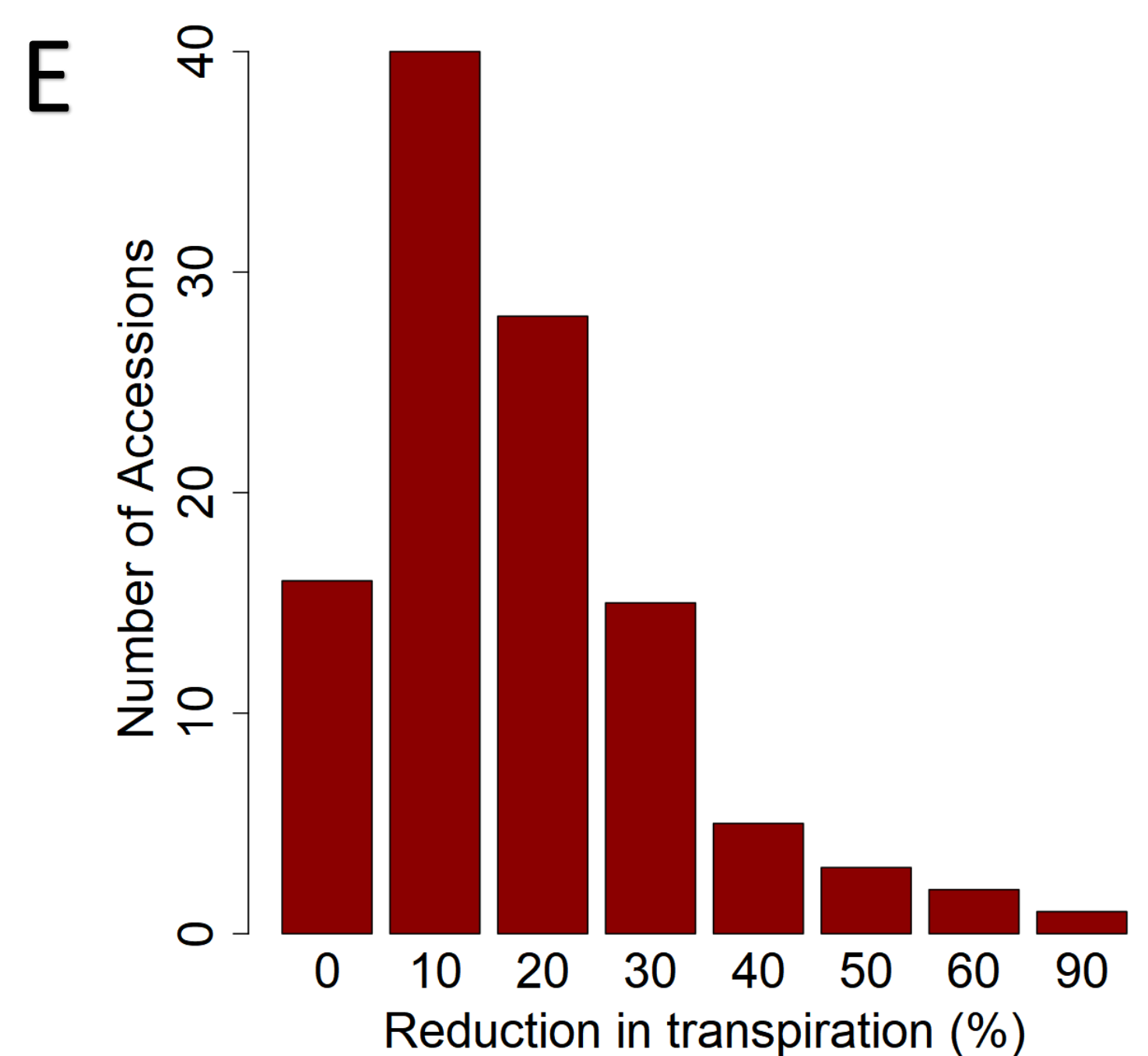
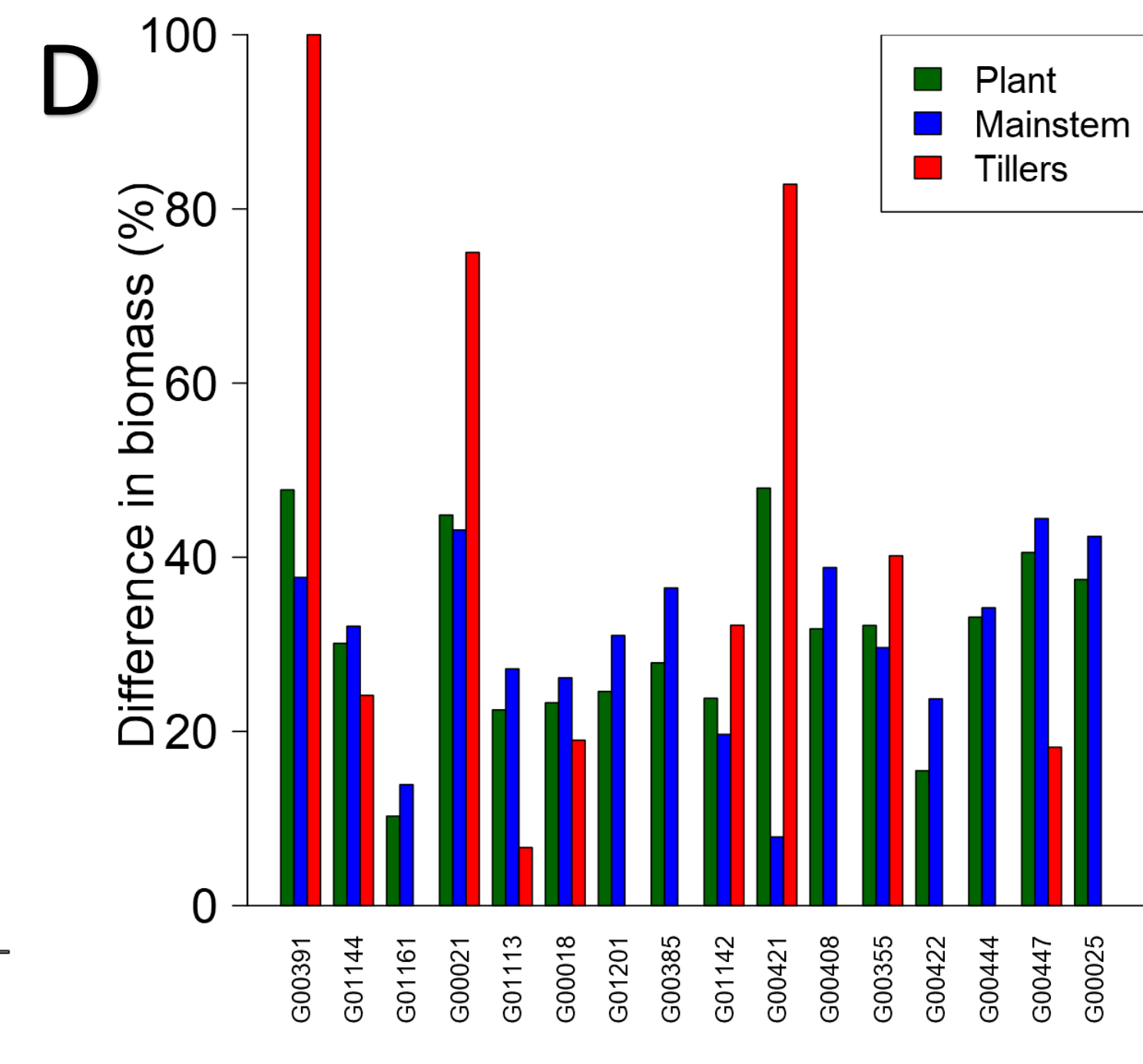
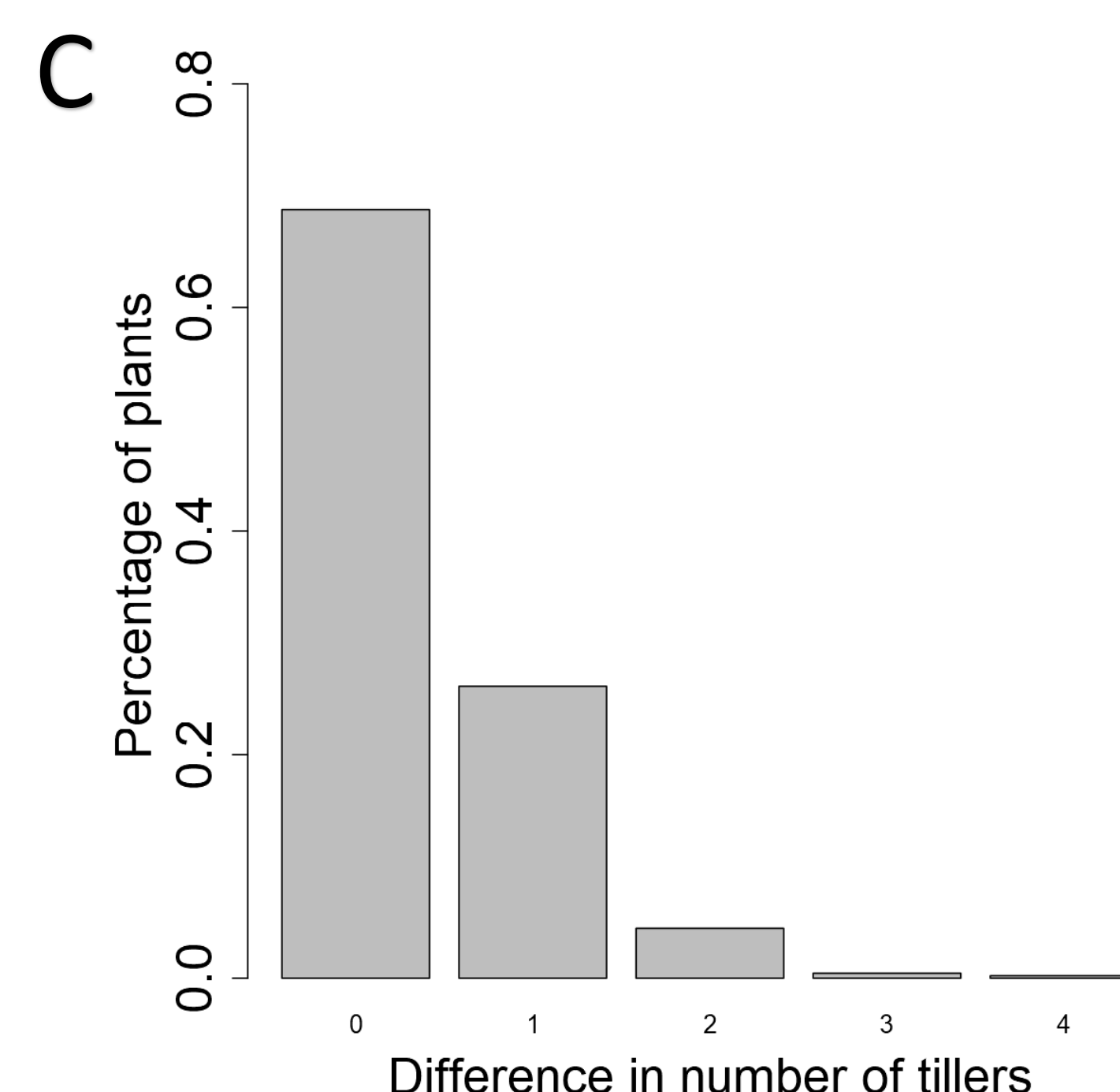
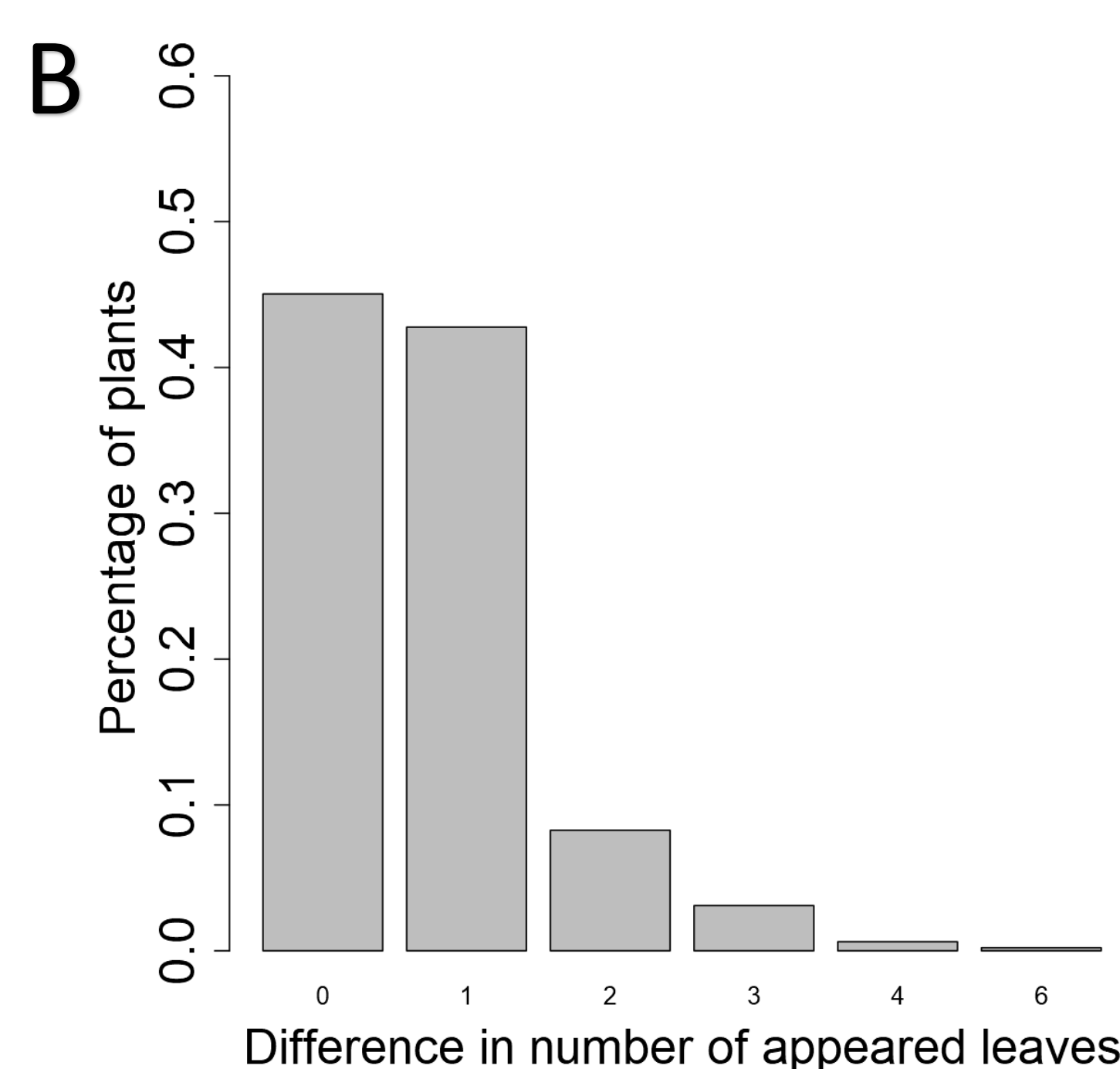
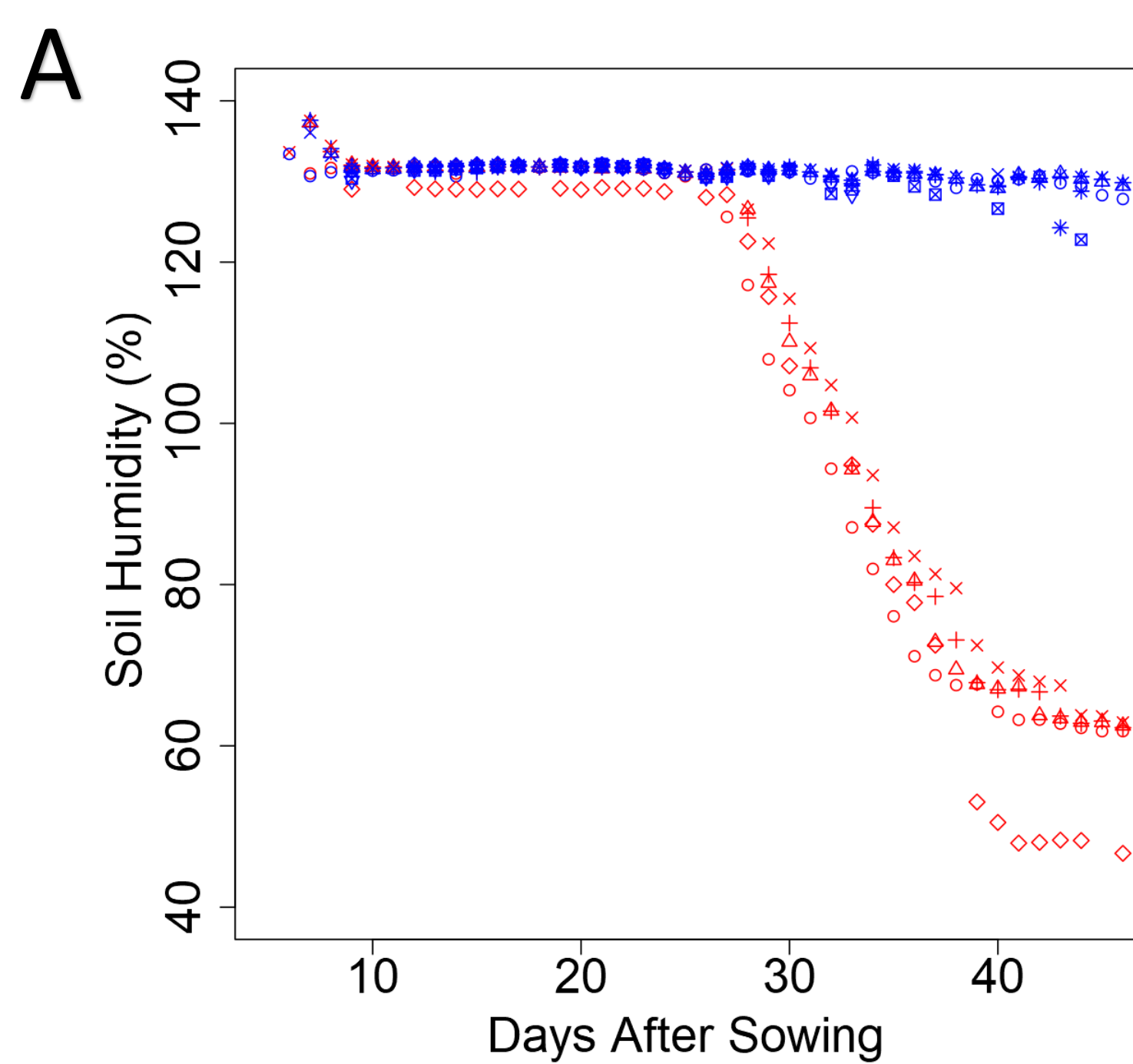
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Materials and Methods

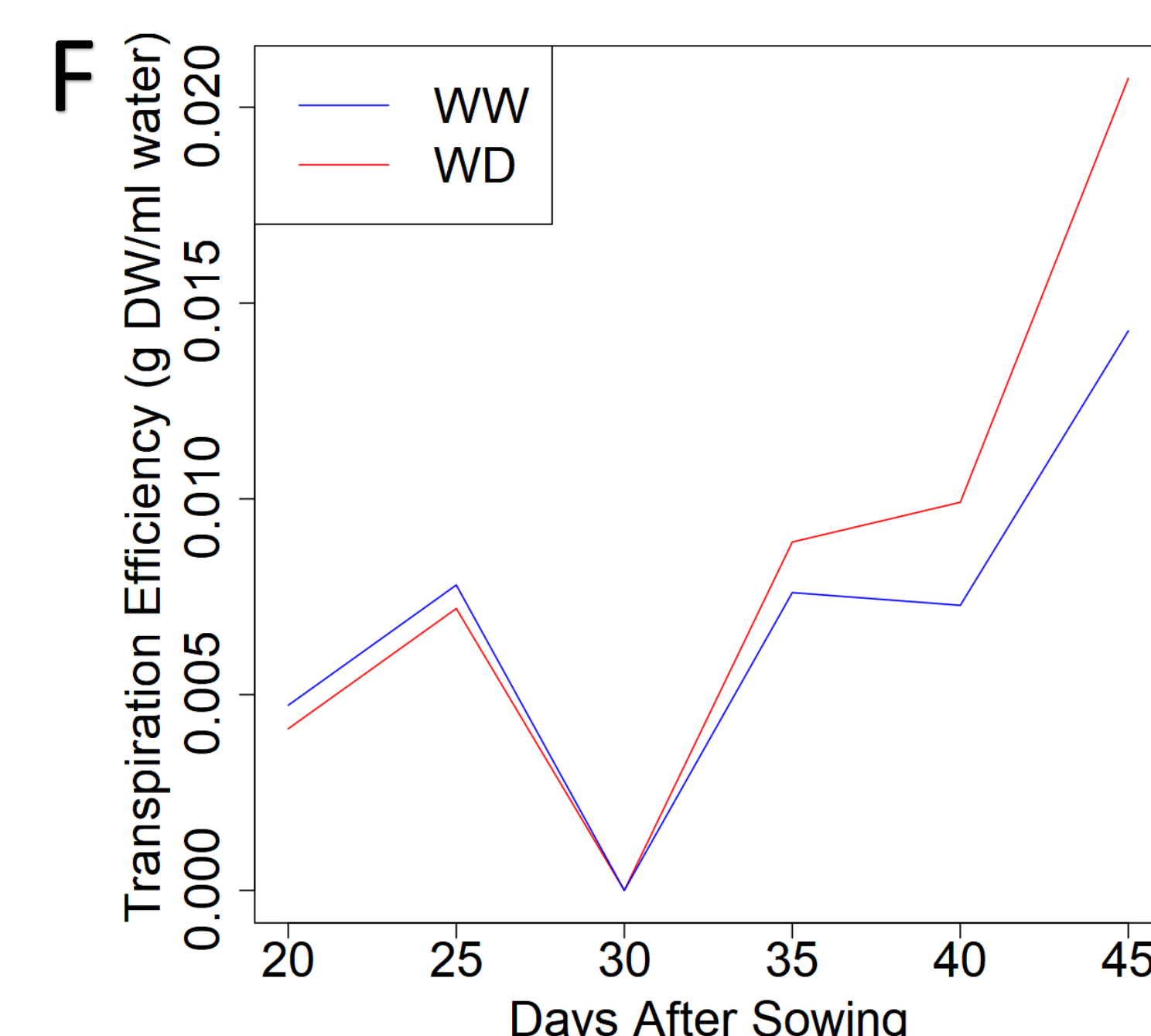
- 196 African Sorghum Accessions
- 2 Water Treatments : WW (130% soil humidity), WD (60±5% soil humidity) see Figure F
- 8 Replicates per Accession for each Treatment



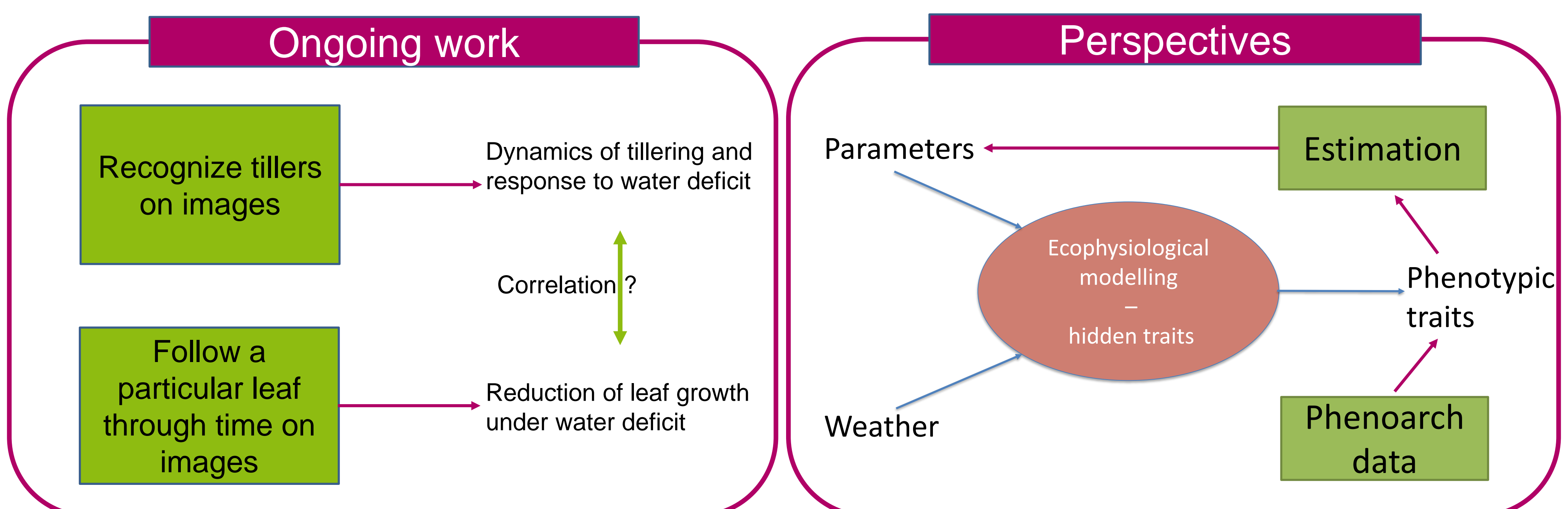
Preliminary Results



- (A) Water management of trial over time : WW (blue) and WD (red) expressed as mean soil humidity per replicate and per treatment. Dry down starts at 26th day after sowing
- (B) The reduction of plant development by water deficit is genotype dependent
- (C) The reduction of tillering by water deficit is genotype dependent
- (D) Plant biomass is reduced by drought differently on Whole Plant, Mainstem and Tillers depending on the genotype (e.g. for 16 Accessions)
- (E) Transpiration is reduced by drought. The distribution shows a genetic variability of this response
- (F) Transpiration Efficiency is increased under drought for some genotypes (g dry weight.ml⁻¹ water)



Conclusion and Perspectives



High-throughput Phenotyping via the Phenoarch platform allowed us to gather daily high quality phenotyping data of 196 African Sorghum Accessions and their response to drought. Ongoing work on tiller and particular leaf rank recognition on images will allow us to gain additional information on how sorghum plants respond to drought. As perspectives, the high-throughput phenotyping data will provide us with the possibility of estimating genotypic, non-measurable parameters of an ecophysiological model using a heuristic genetic algorithm (see oral communication Luquet et al.). Future challenge will be the transition from platform to field phenotyping (see poster of A. Audebert)

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