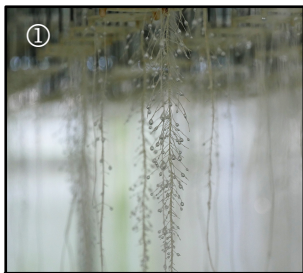


A STUDY WITH COMBINED FIELD - PLATFORM EXPERIMENTS

Two large diversity panels of bread wheat [BW] (234 genotypes) and durum wheat [DW] (250 genotypes) have been phenotyped and studied under various environments:



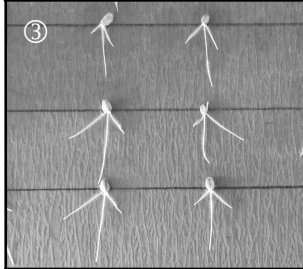
① RootPhAir [RPA]

- High throughput root phenotyping in aeroponics.
- 15 root traits for 15-day old seedlings.
- **Unconstrained** conditions.



② 4PMI

- High throughput root phenotyping in rhizotubes.
- 6 root traits for 15-day old seedlings.
- Under combined **low W & N** supply.



③ Pouch

- 19 root traits for 5-day young seedlings.
- Indicators of sensitivity to water stress for all traits.



④ Field trials

- Yield trait: Indicator of genotypic sensitivity to low W & N across 7 (BW) or 3 (DW) trials.
- AMF trait: AMF colonization percentage (DW panel only, controlled conditions).
- **Unconstrained** conditions and **W and/or N deficits**.

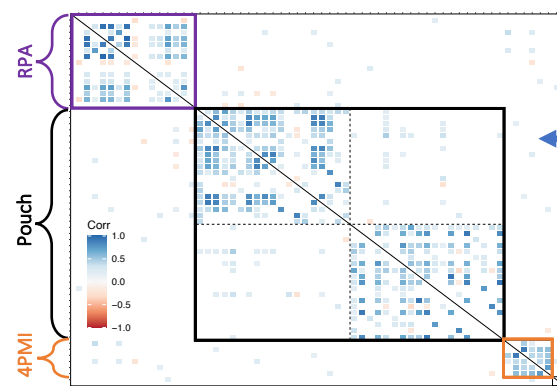


FIG 1. CORRELATION PLOT OF ALL VARIABLES MEASURED IN THE DIFFERENT PLATFORMS (DW).

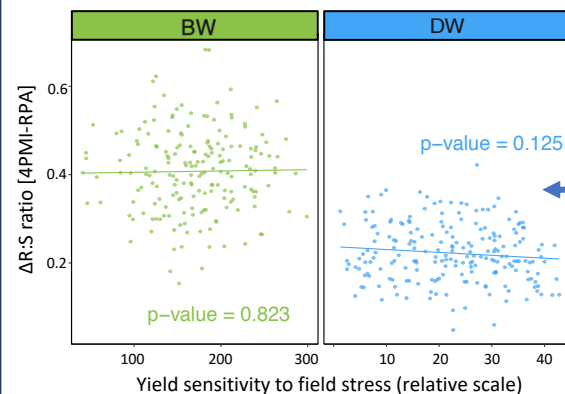


FIG 3. DIFFERENCE OF R:S RATIO BETWEEN 4PMI AND RPA PLATFORMS OVER THE YIELD SENSITIVITY TO FIELD STRESS

MAIN RESULTS

Genetic correlations between variables measured in the same platform are important but genetic correlations between variables measured in different platforms are negligible. Genotype by environment interactions are therefore larger than the average genotypic effect, which means that genotypic differences are largely environment-specific.

We can compare R:S ratio values of 4PMI and RPA as it was measured in the same way. The R:S ratio and its genotypic variance are larger in 4PMI than in RPA, which is consistent with the low W & N in the former. The genotypic variance of the stress response (Δ R:S ratio) is also large which confirms that genotypic differences are environment-specific.

The sensitivity of the R:S ratio (Δ R:S ratio) to platform conditions is independent from the yield sensitivity to field stress. Therefore, the plasticity of seedlings R:S ratio (estimated in platform) does not seem to influence the capacity to stand low W & N conditions in the field.

Interestingly, DW genotypes with large R:S ratio in the RPA platform show a better tolerance to field stress than the others (p-value <0.05, graph not shown) and a higher AMF percentage of colonization in the field (p-value <0.05).

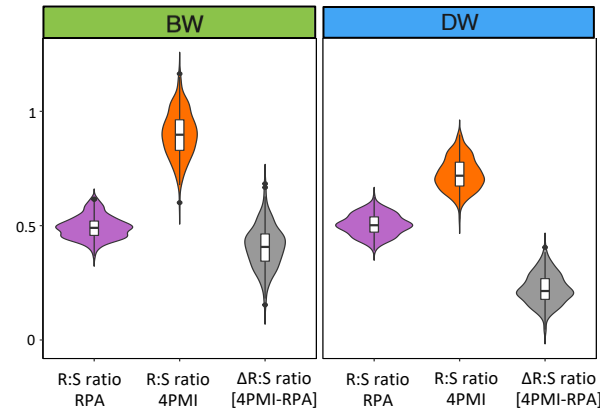


FIG 2. DISTRIBUTION OF R:S RATIO AND DIFFERENCE BETWEEN RPA AND 4PMI PLATFORMS.

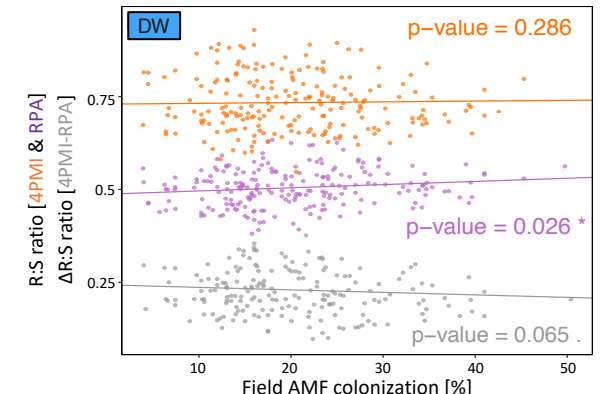


FIG 4. EVOLUTION OF R:S RATIO AND DIFFERENCE BETWEEN 4PMI & RPA OVER THE FIELD AMF COLONIZATION.

TAKE HOME MESSAGES

- The amplitude of genetic variations is smaller than the effect of platform conditions. In addition, the ranking of the genotypes among platforms is not conserved. It is therefore unlikely that traits estimated in platforms would be close proxies of their field analogs.
- The variance of the stress response in platforms suggests that root plasticity is genetically controlled, but the lack of correlations with yield sensitivity indicates that this plasticity may not support stress tolerance in the field.