PROJECT TITLE

Did selection for tolerance to high plant density improve maize growth response in water stress conditions?

CONSORTIUM

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SUMMARY OF THE REPORT

The user FAUBA (Facultad de Agronomía, Universidad de Buenos Aires, Argentina) was successfully selected for the use INRAe plant phenotyping platform installation PhenoArch located at Montpellier, France.

Original schedule included the beginning activities on May 2020, but we had to reorganize it due to the global pandemic COVID-19. Finally, the experiment was carried out on winter 2021 between January and March. The whole experiment including the measurements phase, the preparation of the pots and soil before the sowing, post-processing of plants, the cleaning of platform after the harvest and the data processing accounted for a total of 30 units.

Members of user group could not travel to France because restrictions to move between countries as a part of government regulations to contain the pandemic. To overcome this situation, user and access provider members worked together to rearrange the date and design the experiment. Additionally, INRAe fully supported the experiment by additionally providing a number of staff (including 2 engineers + 2 technicians) to cover (i) the pre-experimental phase (pot filling, loading, platform maintenance, calibration of cameras), (ii) conducting the experiment (observation, real time data analysis for directing experimental choices...), and (iii) the post-experimental phase (unload experiment, cleaning the platform and providing datasets to the hosting group). Conduction of the experiment and pre-analysis of data was managed by INRAe in a daily basis and checked by both group members weekly via remote videoconferences. This method was quite efficient because we had the chance to verify the status of the experiment and already taken data every week.

Summary of the project

Modern maize cultivars selected for grain yield show changes in plant architecture, with a more erect position of the upper leaves that allows light to penetrate deeper into the canopy. We will test whether changes in plant architectural traits through breeding process has indirectly affected hydraulic traits, via changes in transpiration. To address this question, a set of maize hybrids released in France between 1951 and 2012 were grown in the PhenoArch phenotyping platform under two plant densities under well-watered conditions. The hypothesis was that most recent hybrids, selected to tolerate higher plant densities, have an improved water use efficiency because of a moderate transpiration at different strata of the canopy.

Another challenge of the experiment was to test the interest of working with micro plots in a phenotyping platform. Most often, platform experiments involve a random distribution of single plants of every genotype, thereby causing artefact shading of smallest genotypes. Here, we used microplots, thereby avoiding this problem. This also allowed us to compare plant behavior under different densities, which was fully original in a phenotyping platform to our knowledge.