

PROJECT TITLE

Optimization of an enzyme activity assay platform to investigate genetic variation in wheat performance at the high temperature and CO₂ concentration foreseen with climate change and its dependence on nitrogen availability

CONSORTIUM

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SUMMARY OF THE REPORT

This transnational project **OPTENZWHEAT** aimed to link knowledges and technical experience between two European groups, IRNASA-CSIC and INRA-Bordeaux, in order to achieve synergies for the characterization of the natural variability in adaptation to the future climate scenario and its dependency on nitrate availability at the whole plant level. With this purpose, (a) we developed a robot-based platform to determine the activity of a broad group of enzymes of central C-N metabolism for wheat, and (b) we used the developed platform to explore the variation in performance across wheat genotypes grown under combined elevated CO₂ and high temperature at two nitrogen supplies. In a first step, we used a standardized optimisation protocol for enzyme assays using biological or enzymatic standards that guarantees flawless measurements for each tissue studied. This protocol enabled us the identification of the optimal dilution of the extract, the recovery of the standards and the error expressed as the coefficient of variation (the ratio of the standard deviation to the mean) for both leaves and roots. We therefore achieved our goal as long as we successfully optimised 19 enzyme assays in leaves and 17 in roots. In a second step, the high-throughput enzyme assays were performed in plant material from eight wheat genotypes grown under controlled environmental conditions at low and high nitrogen supply harvested at three different developmental stages. The evaluation of the enzyme activities throughout development exhibited variation between organs, nitrogen availability and among genotypes. These data generated at HiTMe facility require further study by their integration with metabolites and other physiological characteristics that are being measured by IRNASA-CSIC. The results of the project may help to the identification of traits for the improvement of crop yield in the face of climate change. The developed platform is a pioneering tool for this plant species and can be used to investigate wheat responses to other abiotic stresses.