

PROJECT TITLE

Metabolite profiling in winter wheat during cold acclimation, deacclimation and reacclimation

CONSORTIUM

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SUMMARY OF THE REPORT

Currently, there is a gap in knowledge regarding winter wheat metabolic profiles during cold acclimation. Furthermore, the impact of elevated temperatures and reduced duration of cold acclimation on freezing tolerance of winter type crops is not explored sufficiently. The main aim of this research project was to investigate whether higher temperature and shorter duration of cold acclimation alter the profiles of main metabolite groups and how this in turn affects the freezing tolerance of winter wheat.

For this project, 6 winter wheat varieties, displaying different winterhardiness scores (susceptible, intermediate, winterhardy) were selected and grown under 3 different temperature conditions (2 °C, 10 °C, 20 °C) and subjected to deacclimation and reacclimation. Samples for metabolic phenotyping were collected from leaf and crown region tissues once a week for 10 weeks. Additionally, an RGB sensor was used to collect green leaf area and growth rate data. In total, 22 metabolic traits were measured at the HiTMe (High Throughput Metabolic phenotyping) installation at INRAE Nouvelle-Aquitaine Bordeaux. These traits include glucose, fructose, sucrose, starch, malate, citrate, protein content, amino acid content, proline, fructose 6-phosphate, glucose 6-phosphate, glucose 1-phosphate, polyphenols, chlorophyll, total antioxidant capacity, cell wall content, total and reduced ascorbate, total and reduced glutathione, and oxidised NAD and NADP.

Initial statistical analyses show significant differences in accumulation of major carbohydrates between different temperature treatment groups. Freezing tests will be carried out to acquire additional data. Subsequently, correlations will be ascertained between metabolite profiles, freezing tolerance and growth rates of all 6 genotypes and treatment groups.