**Ecophysiological processes underlying soybean mineral nutrition under individual or combined heat and water stresses**

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In a context of climate change, with more frequent drought events and heatwaves, it is predicted that soybean yields will drastically decrease in the near future. Soybean being the most widely grown legume crop in the world, there is an urgent need to improve its ability to sustain its growth under such conditions in order to guarantee high levels of productivity. The aim of this study was to explore the influence of heat and/or water stress on soybean growth and its water and mineral nutritions. Two soybean genotypes, displaying contrasted root architectures during their vegetative stage were grown under controlled conditions in the 4PMI high-throughput phenotyping platform where either optimal conditions, or heatwaves, or water stress, or both heatwaves and water stress were applied. Plants were characterized for their morphology, their water uptake, the mineral composition of their tissues and the root transcriptome. An ecophysiological structure-function framework, enabled us to link structural variables (leaf area, root architecture, biomass, etc.) to functional variables (water use efficiency, element uptake efficiencies…) in order to understand the interactions between water and element fluxes, and to quantify the overall tolerance of plants to each stress. Under combined stress conditions, one genotype appeared more sensitive than the other. No significant changes in structural variables were observed in response to the dual stress between the two genotypes. However, the genotypic difference was found to be more related to functional changes, particularly for water uptake. A complementary analysis of the plant ionome and transcriptome under different stresses revealed plant strategies favoring soybean growth under these two stresses, and offered new perspectives for crop adaptation to climate change.