METABOLOMIC PROFILING OF SUNFLOWER SEEDS IN RESPONSE TO WATER STRESS DURING GERMINATION

Marine Pellen [1], ***Thierry Berton*** [2], ***Stephane Bernillon*** [2], ***Mickael Maucourt*** [2], ***Catherine Deborde*** [2], ***Natalia Falagan*** [2], ***Annick Moing*** [2], ***Hayat El-Maarouf-Bouteau*** [3], ***Christophe Bailly*** [3]

[1] *SOLTİS*
[2] *UMR1332 Biologie Du Fruit Et Pathologie*
[3] *UPMC*

marine.pellen@upmc.fr

ABSTRACT

Climate change is now recognised as one of the most serious challenges facing the world. In particular, climate change is a challenge for farming, and water limitation is a major abiotic stress which affects seed germination, stand establishment and *in fine* crop yields. Therefore, agricultural adaptation is necessary for the future and there is a need to better understand the molecular and cellular bases of tolerance to water stress during seed germination. In this context, tolerance to water stress during sunflower (*Helianthus annuus* L.) seed germination was studied. Seeds from one tolerant and one sensitive sunflower hybrid were selected with regards to their ability to germinate under water limitation, using a polyethylene glycol (PEG) solution (- 0.6 MPa, 20°C). A non-targeted metabolomic study was then carried out using seeds imbibed for 15 h at 20°C on water and on the PEG solution in order to identify seed metabolites associated with tolerance to water stress during the germination phase. We used liquid chromatography coupled to mass spectrometry (LC-MS) and proton nuclear magnetic resonance spectroscopy (1H-NMR). 1H-NMR spectra and the main compounds of MS spectra were annotated. Thus, 47 major compounds were selected and univariate and multivariate statistical analyses were carried out on these compounds. Statistical analyses were also performed on the entire MS profiles. Our analyses demonstrate that the metabolic profiles differ more between the two hybrids than between the two treatments. The effect of PEG imbibition was also investigated for each hybrid. We observe more response markers for the tolerant hybrid than for the sensitive one, suggesting that the metabolism of seeds from the tolerant hybrid is more affected by water stress.

Key Words : Sunflower, water stress, metabolomics, LC-MS, NMR