AC-DCC

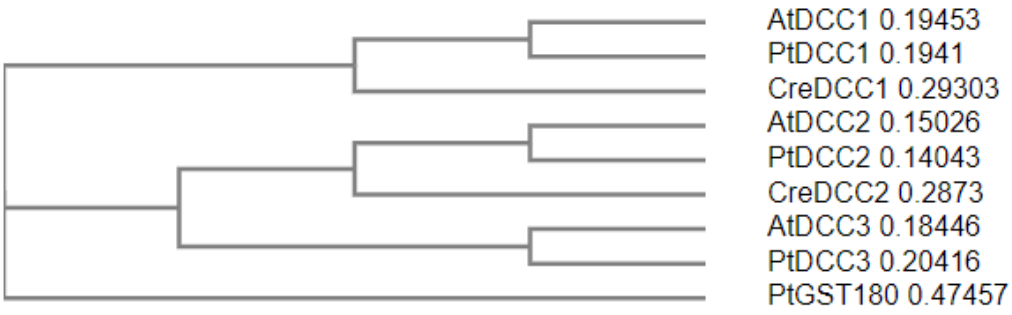

Figure 1. Conservation des protéines DCC entre le peuplier *Populus trichocarpa*, la plante terrestre *Arabidopsis thaliana* et l'algue *Chlamydomonas reinhardtii*. PtGST180 a été utilisé pour le branchement de l'arbre. L'arbre phylogénétique a été réalisé en utilisant la méthode de calcul de Neighbor-joining à partir de la plateforme Embl-Ebi.

Attribute a role to the Conserved and unassigned DCC proteins

Principle investigator: Linda DE BONT, UMR Interactions Arbres/Micro-organismes (IAM)

LabEx partners: ASIA platform

Context —
Photosynthesis and respiration are two essential metabolic pathways in photosynthetic organisms controlling their energy balance. Like most metabolic processes, photosynthesis and respiration are finely regulated by reduction/oxidation (redox) mechanisms. However, among the hundreds of proteins regulated by redox exchanges, a large number of proteins have no assigned functions to date. In proteins, the combination of a CXXC motif (two reactive cysteines separated by two other amino acids X) and a thioredoxin folding characteristic of thiol:disulfide oxidoreductases is particularly suited to dithiol-disulfide exchange reactions. The presence of a CXXC motif in proteins with unknown functions and predicted to be located in the chloroplast or the mitochondria therefore constitutes an interesting observation for a possible involvement in redox metabolism.

Objectives —
Among the proteins of unknown function in *Populus trichocarpa*, we identified a small family of three proteins that we named DCC1-3, due to the presence of a conserved DXXCXXC motif, and which possess a potential sequence for the chloroplast or the mitochondria. The AC-DCC project aims to carry out a biochemical study of DCC proteins with the aim of characterizing new pathways with redox activity in plants.

Approaches —
In order to characterize the role of DCC proteins, a three-step approach has been initiated. The aim is to produce recombinant proteins corresponding to the mature forms of DCC proteins in order to undertake their biochemical and structural characterization. Then, the isolation of the protein partners of the DCCs followed by the characterization of in vitro and in vivo interactions will make it possible to define the protein interaction network of the DCCs.

Key results — (presented as separated bullet points)
- Cloning of the coding sequence devoid of DCC targeting peptide for two-hybrid analysis in yeast
- Cloning of the coding sequence of DCC1 in order to obtain plants overexpressing DCC1
- Localization of DCC1 in leaf extracts, enriched in chloroplasts or in mitochondria by Western blot using specific antibodies directed against this protein

Main conclusions including key points of discussion —
Most of the molecular biology constructions have been carried out. The first expression tests in *E. coli* and the solubility of DCC proteins was not satisfactory, so different bacterial strains available in the laboratory with various properties (such as allowing the expression of rare codons or chaperone proteins for example) were tested. in order to improve the solubility of proteins and thus to carry out the biochemical analysis of DCC proteins.

Perspectives —
The biochemical and structural analysis of the DCC recombinant proteins will be carried out from proteins expressed in the best strain. Secondly, the DCC protein interaction network should make it possible to decipher the function of these proteins.

Valorization — (scientific: publications, book chapter, presentation at conferences,...); economic: Soleau envelope, patent, license,...; distribution: press release, interview,...)
To date, the AC-DCC project has not yet been valued.

Leveraging effect of the project—
Following the AC-DCC project, a structuring research project was funded by the A2F pole of the University of Lorraine in order to complete the study of DCC proteins. A thesis funded by the MESRI aimed at the functional analysis of candidate proteins with oxidoreductase activity in plant organelles (including the study of DCC proteins) began in October 2021.