INVolVEMENT OF A WALL-ASSOCIATED KINASE AND A WRKY TRANSCRIPTION FACTOR IN TWO POPULUS SPP. OZONE STRESS RESPONSE

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As a result of anthropogenic activities, concentrations of tropospheric ozone (O₃) have increased during recent decades. Ozone is now considered to be the most phytotoxic of all the common air pollutants. Plants exposed to environmental changes due to pollution undergo suitable changes in gene expression. Depending on its concentration and plant species, ozone causes two different types of responses commonly referred to as acute and chronic. The acute ozone response is considered an excellent tool to study ozone tolerance and susceptibility among model plants that is important to identifying tolerant genotypes.

To improve the knowledge about the molecular mechanisms of acute ozone stress response and tolerance at the level of gene expression in two hybrid poplar clones (Populus deltoides x maximowiczii, Eridano clone, and Populus x euoramericana, I-214 clone, sensitive and tolerant to O₃, respectively) a gene identification study was previously performed using suppression subtractive hybridisation (SSH). Several differentially expressed cDNA were isolated and sequenced transcripts were subdivided in seven main functional categories such as signal transduction, disease/defence, metabolism and secondary metabolism, energy, cell cycle and DNA processing, protein synthesis and fate and unknown genes.

We obtained interesting data from expression analysis of transcripts belonging to signal transduction category (Wall associated kinase, Ft32C-WAK, Calmodulin-like protein, Ft33B-CaBP, WRKY transcription factor, Ft312B-WRKY and Leucine-rich repeat protein, Fs23A-LRP). Particularly, we observed that the steady state level of Ft32C-WAK transcript was increased by O₃ treatment only in tolerant poplar plantlets. Time course expression analysis shows that Ft32C-WAK up-regulation occurs after 2 h of O₃ exposure and continues since 5 h O₃ in tolerant poplar. On the contrary, expression analysis performed on O₃ treated sensitive poplar plantlets shows a weak Ft32C-WAK up-regulation after 5 h of O₃ treatment. Intriguingly, Ft312B-WRKY transcript shows the same Ft32C-WAK expression behaviour in tolerant poplar, suggesting a link between the two protein functions. According to these observations the hypothesis of an interaction between Ft312B-WRKY transcription factor and Ft32C-WAK promoter region was considered. WAK is a sub-family of plant receptor-like protein kinases (RLKs) involved in signal transduction during stress response. Given that the promoter regions of several RLK family genes contain W-box, which represents a DNA sequence motif specifically recognized by WRKY superfamily members, Ft32C-WAK upstream region was isolated.
These investigations will allow to understand if the activation of Ft32C-WAK during defence response to O$_3$ stress in tolerant poplar is Ft312B-WRKY dependent and to clarify the different behaviour of the two transcripts in sensitive versus tolerant poplar species.