Characterization of a poplar GM tree with strong alterations in growth and wood anatomy: transgene expression level vs insertion site effects?

Miyuki Takeuchi, Fernanda Trilstz Perassolo Guedes, Françoise Laurans, Marie-Claude Lesage Descauses, Nathalie Boizot, Véronique Laine-Prade, Amra Secerovic, Jean-Charles Leplé, Annabelle Dejardin, Gilles Pilate

CHARACTERIZATION OF A POPLAR GM TREE WITH STRONG ALTERATIONS IN GROWTH AND WOOD ANATOMY: TRANSGENE EXPRESSION LEVEL VS INSERTION SITE EFFECTS?

Takeuchi M (1,2), Guedes FTP (1, 3*), Laurans F (1), Lesage-Descauses MC (1), Boizot N (1), Lainé-Prade V (1), Secerovic A (1), Leplé JC (1), Déjardin A (1), Pilate, G (1,**)*

1: AGPF, INRA, 45075, Orléans, France

2: Present address: Graduate School of Agricultural Life Sci, Tokyo University, Tokyo, Japan 3: Present address: Faber-Castell, Brazil

**: These two authors contributed equally to this work*

***: gilles.pilate@inra.fr*

Hardwood trees are able to reorient their axes in response to environmental cues, thanks to the formation of tension wood (TW), a peculiar wood with striking mechanical properties. In many species including poplar, TW fibres harbor a supple- mental cell wall layer named G-layer. A number of arabinogalactan proteins (AGP) have been shown to be up-regulated during tension wood formation in poplar. In order to unravel the function of this class of proteins in cell wall formation, we produced and analyzed a number of GM poplar lines modified for the expression of a fasciclin-like AGP. One and only one of these GM lines (named Miyuki) exhibited a very strong phenotype with a loss of apical dominance, twining stems, reduced growth and increased pathogen sensitivity. The genetic modification also led to important alterations in wood anatomy. Modifications in the distribution of polysaccharides in fiber cell walls suggested an early G-fibre maturation in Miyuki compared to WT poplars.

Strong phenotype of Miyuki plants. On the right, a WT plant (scale is different)

A single T-DNA insertion was detected in Miyuki, located in the nearby of an ABR1 homologue, a negative regulator of the ABA signaling pathway involved in responses to stress conditions. Further, we compared gene expression profile between Miyuki and WT plants: ABR1 was over-expressed in the Miyuki compared to WT, which may explain a loss of ABA response as supported by the analysis of co-expression networks. Thus, the strong Miyuki phenotype probably results for an important part from an alteration of the ABA signaling pathway. This work has been partly funded by the "Stress in Trees" project (ANR-12-BS09-0004)