DNA methylation in poplar: genetic variability and phenotypic plasticity

Grant: Public < 25 K€ / year, 3 years
Place: University Orléans – France
Laboratory: Wood Biology and crop plants (http://www.univ-orleans.fr/lblgc/)
Domain: Molecular biology and epigenetic
Application date: 30/04/2013
Mentors: Prof S. Maury (http://www.univ-orleans.fr/lblgc/stephane-maury) and Prof F. Brignolas (http://www.univ-orleans.fr/lblgc/franck-brignolas)

Thematic and objective of the work:

Predicted climate changes and particularly drought represent a major threat to forest health. Therefore, understanding mechanisms that control trees response to variations in water availability is of great interest. These last years, epigenetic marks such as DNA methylation have been involved in plant phenotypic plasticity in response to environmental stresses. In this context, this work aimed at assessing the role of shoot apical meristem cells DNA methylation in the shoot developmental plasticity towards variations in water availability in poplar, a model tree. The impact of variations in water availability or different pedo-climatic context on shoot apex DNA methylation in different hybrids (*P.* × *euramericana*) or *P. nigra* will be studied. Loci and gene networks affected by DNA methylation and expression changes will be characterized. Different approaches using MethylDNA immunoprecipitation (MeDIP), methylation microarray, next generation sequencing will be apply.

Keywords: chromatin, DNA methylation, drought, epigenetics, gene expression, genotypic variability, morphogenesis, poplar, phenotypic plasticity, shoot apical meristem, water availability

Profile of candidate:

Candidate should have validated a master degree in plant Sciences and have a basic knowledge in molecular biology concepts and methods (PCR, cloning…). Abilities in bioinformatics or epigenetics are welcome. Candidate should send CV, motivation letter and the results of their master exams before 30/04/2013 by email to stephane.maury@univ-orleans.fr

Few references:

1. Gourcilleau D, Bogeat-Triboulot MB, Le Thiec D, Lafon-Placette C, Delaunay A, El-Soud WA, Brignolas F, Maury S (2010) DNA methylation and histone acetylation: genetic variations in hybrid poplars, impact of water deficit and relationships with productivity. Annals of Forest Science 67, 208 1-10. doi 10.1051/forest/2009101.
2. Chamaillard S, Fichot R, Vincent-Barbaroux C, Bastien C, Depierreux C, Dreyer E, Villar M, Brignolas F (2011) Variations in bulk leaf carbon isotope discrimination, growth and related leaf traits among three Populus nigra L. populations. Tree Physiology 31: 1076-1087
3. Maury S, Trap-Gentil M-V, Hébrard C, Weyens G, Delaunay A, Lefebvre M, Barnes S, Joseph C (2012) Genic DNA methylation remodelling during in vitro organogenesis: organ-specificity and conservation between parental lines of epialleles. Physiologia Plantarum 146, 321–335.
4. Lafon-Placette C, Faivre-Rampant P, Delaunay A, Street N, Brignolas F, Maury S (2012) Methylome of DNase I sensitive chromatin in Populus trichocarpa shoot apical meristematic cells: a simplified approach revealing characteristics of gene-body DNA methylation in open chromatin state. New Phytologist 197, 416-430. doi: 10.1111/nph.12026.
5. Bräutigam K, Vining K, Lafon-Placette C, Fossdal CG, Mirouze M, Gutiérrez MJ, Fluch S, Fernández Fraga M, Guevara MÁ, Abarca D, Johnsen Ø, Maury S, Strauss SH, Campbell M, Rohde A, Díaz-Sala C, Cervera MT (2013) Epigenetic regulation of adaptive response of forest tree species to the environment. Ecology and Evolution 3, 399–415. doi 10.1002/ece3.461.