Advancing Our Understanding of Poplar Growth Using a Multi-Omics Approach

Poplar is a promising resource, valued not only for wood production and the development of lignocellulosic biomass, but also for its potential role in carbon sequestration. This manuscript by Duruflé et al. presents a comprehensive study on the genetic basis of radial stem growth variation in natural populations of black poplar (*Populus nigra*). Recognizing the importance of stem growth for wood production and biomass development, the authors sought to identify the QTLs regulating this trait. They employed a systems biology approach, integrating genomic, transcriptomic, and phenotypic data from a large collection of poplar genotypes. The GWAS analysis identified SNPs linked to two gene models predicted to encode chalcone isomerase (CHI), an enzyme involved in the flavonoid pathway. The authors then used the RNAseq data to test whether the expression of the candidate genes correlated with the phenotypes, and indeed the level of expression of both genes displayed a correlation to the circumference. To support their findings, the authors compared the location of the QTL detected in this study with previously published QTLs. Interestingly, they found a previously reported QTL co-localizing with the newly identified one. The authors have addressed the concerns raised by reviewers on the GWAS analysis and discussed the complication of this QTL study in the manuscript.

In essence, the authors have combined the power of GWAS and transcriptomics to locate candidate genes and applied population genetics to explore the evolutionary context of the identified gene. This comprehensive approach provides strong evidence for the role of CHI in controlling radial stem growth variation in black poplar. The study opens up avenues for further research into the precise mechanisms by which CHI and flavonoid metabolism influence stem growth and provides useful information for future poplar breeding programs.

References

Harold Durufle, Annabelle Dejardin, Veronique Jorge, Marie Pegard, Gilles Pilate, Odile Rogier, Leopoldo Sanchez, Vincent Segura (2025) Natural variation in chalcone isomerase defines a major locus controlling radial stem growth variation among Populus nigra populations. bioRxiv, ver.3 peer-reviewed and recommended by PCI Genomics <u>https://doi.org/10.1101/2024.10.21.618920</u>