Invitation à la soutenance publique de thèse

Pour l’obtention du grade de Docteur en sciences agronomiques et ingénierie biologique

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Contribution to a multi-disciplinary approach aiming at understanding hemp cell wall dynamics

The interest around hemp is currently renewed for the production of bio-based and renewable materials in the context of global warming. This fibre crop is able to produce large amounts of fibres with different features and industrial application. The most valuable fibres, found in the phloem tissue, are rich in cellulose while relatively poor in lignin, by contrast with the xylem tissue. This thesis aims at studying the events related to the biogenesis of these two types of fibre. Using two different systems, we will investigate the molecular mechanisms related to elongation, secondary growth, deposition and maturation of the cell wall and bast fibre development.

Our first objective is to provide a comprehensive overview of the transcriptional factors and phytohormones involved in primary and secondary growth. To this end, the development of the hemp hypocotyl is investigated by a high throughput transcriptomic approach, in addition to proteomics, phytohormone and lignin analyses and microscopy. We show that elongation and secondary growth are characterised by specific patterns of gene expression. The consequences on the biogenesis and modification of the cell walls are widely discussed.

The second objective is to decipher the molecular actors associated with the development of the bast fibres. We first show that the contrasting composition of xylem and bast fibres is regulated at the transcriptional level. Next, we highlight the evolution of the transcriptome during the development of the bast fibres, from intrusive growth to thickening. We put a special emphasis on the study of cell wall-related genes (cellulose synthase, fasciclin-like arabinogalactan, transcription factors) and phytohormones. We also formulate several hypotheses to explain the hypolignification of the bast fibres.

Finally, this thesis ends with the perspectives raised by our results, notably concerning the deposition of cellulose, non-cellulosic polysaccharides and lignin in the bast fibres.

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