



Impact of DNA methylation gene mutations on Arabidopsis periderm formation

Place of work: ForGen Lab – Forest Genomics and Molecular Genetics Laboratory - Faculdade de Ciências da Universidade de Lisboa (FCUL)

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Abstract / MSc thesis project proposal

The periderm is a protective layer from adverse environmental conditions that replaces the epidermis of primary tissues during stem and root radial thickening. It is a three-part layered structure composed of the mother cell layer - the phellogen - the tissue it originates to the inside, the phellogen, and the tissue it originates to the outside - the phellem or cork.

In cork oak, the differentiation of cork cells involves chromatin condensation and *de novo* DNA methylation, that together with the association between this epigenetic mark with cork variability suggests that phellogen activity and cork cells fate is potentially regulated by DNA methylation. To test this hypothesis, we will use Arabidopsis hypocotyl periderm as a model, a species where DNA methyltransferases loss-of-function mutants are currently available.

The workplan will include:

- (I) phenotypic analysis of hypocotyl periderm formation in wild type (wt) plants and Arabidopsis mutants already available (*met1-3*; *drm1 drm2 met1*; *suvh4/kyp*; *drm1 drm2 cmt3*) through histologic analysis (confocal microscopy) and selection of mutants with more altered phenotypes;
- (II) analysis of DNA methylation level of genes and their regulatory regions involved in periderm formation (from phellogen induction to cell wall suberization and programmed cell death) using currently available methylomes;
- (III) analysis of gene expression by RT-qPCR of genes with changes in methylation levels either in regulatory regions or in gene body in wt and mutant lines;
- IV) correlation analysis between methylation levels and gene transcription levels in wt and mutant lines, to identify genes potentially under epigenetic regulation via DNA methylation, that can be associated with the more altered phenotypes.

The work will be supported by a national project funded by FCT integrating a multidisciplinary team of researchers from different Portuguese institutions (ISA and FCUL). The student will acquire several skills in molecular biology, histology and microscopy techniques and bioinformatics, transversal to research areas. The student will develop his/her knowledge of experimental tools and techniques and teamwork ability, autonomy, organization, and critical thinking, essential in any professional area.