



## BioISI - Biosystems & Integrative Sciences Institute

### Functional characterization of specific miRNAs associated to the molecular pathways regulating embryogenesis in plants

Place of work/: BioISI/FCUL, ForGen lab <http://forgen.rd.ciencias.ulisboa.pt>

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**Introduction:** The microRNAs (miRNAs) are one class of small non-coding RNA that regulate the expression of target genes through post-transcriptional mechanisms. Many known miRNAs have essential functions in diverse developmental processes, and in the response to biotic and abiotic stresses. Embryo differentiation from somatic cells (somatic embryogenesis) is a process that can be induced *in vitro* in many plant species and it is used in biotechnology for plant clonal propagation and genetic transformation. However, a better understanding of the molecular pathways that control embryo development is needed for efficiently using somatic embryogenesis in forest species with high economic and ecological value. Somatic embryogenesis can contribute to propagate genotypes of interest based on their superior traits for increased productivity and resistance to biotic stresses. Previous studies in our lab have identified several miRNAs associated to the embryo development in conifers due to their interaction with essential pathways, including auxin signaling and miRNA biogenesis.

**Objective:** Characterization of miRNA functions during embryo development of a model conifer species, by using transgenic lines with different expression levels of the miRNAs under study.

**Workplan:** The experimental work includes three main tasks: **(I)** *in vitro* culture of control embryogenic lines and transgenic lines with modified miRNA expression; **(II)** molecular analysis of transgenic lines by RT-qPCR or *in situ* hybridization; **(III)** phenotypic characterization of somatic embryos in consecutive developmental stages by stereomicroscopy and light microscopy; **(IV)** integrated analysis of the results and thesis writing.

As main result, a model of miRNA function will be proposed, according to the results obtained in this work and in published works for other species. The student will acquire competences in molecular biology and genetics, transversal to different research areas. The proposed work will be developed in close collaboration with the work of a PhD student in the scope of an ongoing project in the ForGen lab.

The student selected for this project, after thesis registration, is eligible to apply to the **BioISI Junior Programme** (supporting 8 students with a 6-month Scholarship (BII)), being the selection criterium the academic merit of the candidates.