

**GPlantS Unit**

**Instituto de Tecnologia Química e Biológica (ITQB)**

**Instituto de Biologia Experimental e Tecnológica (iBET)**

**Project Title:**

**Identification of transcription factors regulating cork oak (*Quercus suber*)  
*QsUNK1* gene during abiotic and biotic stress response**

Cork oak (*Quercus suber*) agro-forests from the western Mediterranean regions are natural resources that play major roles in soil protection, carbon sequestration and regulation of natural cycles. Cork is a self-regenerating raw material with unique qualities and diverse applications, which is extracted as a sustainable exploitation, directly contributing to local economies and forest conservation.

**Project outline:**

Cork oak forests are an important source of national income due to cork industry but a number of threats, of biological (e.g. *Phytophthora cinnamomi*) and environmental nature (e.g. heat waves, drought and severe cold) are causing population decline. Due to cork oak's strategic significance for Portugal a joint project (SuberStress) was initiated aiming to assess the cork oak transcriptome and identify genes putatively involved in the crosstalk between different stresses. A group of 10 genes was already identified and while most of them have been annotated to a specific function in stress signalling or response, one has a completely unknown function. This gene, *QsUNK1*, is transcriptionally induced by heat, drought and root infection by *P. cinnamomi*. The goal of the current project proposal is to elucidate the signalling pathway(s) regulating this gene by identification of transcription factors (TFs) that may bind to the promoter region of *QsUNK1*. To achieve this, the promoter region of *QsUNK1* will be cloned and used as bait for Yeast One-hybrid screens using stress-induced cDNA libraries. To assess the role of the newly identified TFs as activators or repressors of *QsUNK1* expression, transactivation assays will be performed using plant protoplasts. To assess the relevance of the newly identified TFs in cork oak stress response, expression studies will also be conducted using

real-time RT-PCR. Besides unravelling novel signalling pathways involved in the crosstalk between abiotic and biotic stress in cork oak, this project will provide novel insights into the role of QsUNK1 in stress response.

Main techniques to be used:

- Inverse PCR
- *E.coli* and *S. cerevisiae* transformation
- Yeast one-hybrid screening
- Transactivation assays using protoplasts
- RNA extraction
- Real-time RT-PCR

**Approximate duration:** 9 months

**Number of students:** 1 highly motivated student

**Working place:** The work will be conducted at the Genomics of Plant Stress Laboratory (GPlantS, <http://www.itqb.unl.pt/labs/gplants/>), at ITQB, Oeiras, Portugal.

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