

**Propostas de Planos de Tese de Mestrado**  
**Instituto de Tecnologia Química e Biológica**  
**Genomics of Plant Stress Laboratory (GPlantS lab)**



**Title: Characterization of *Jatropha curcas* drought responsive genes**

Abiotic stress, such as drought or salinity, is responsible for important crop losses worldwide. In this context, species particularly well adapted to extreme environmental conditions may help to unveil new stress tolerance mechanisms, to be explored in breeding programs or transferred to specific crops. One of our target species is *Jatropha curcas*, a species that is able to grow on marginal soils or on soils prone to desertification due to a natural tolerance to severe water limiting conditions as well as to saline soils. This Euphorbiaceae species has been attracting much attention in the past few years due to the good quality oil of its seeds, which can be used as biodiesel in alternative to fossil fuels. Moreover, the reason of *J. curcas* high tolerance to drought has been poorly explored and only few genes have been, so far, identified as related to drought tolerance mechanisms.

**Background and aims:**

In our lab we have studied two *J. curcas* accessions, one from Indonesia (wet tropical climate) and the other from Cape Verde islands (semi-arid climate), under water deficit [1]. We have chosen an integrative strategy combining morpho-physiological and molecular analyses to characterize the plant behavior under drought stress versus control conditions. Using a transcriptomics approach, we have identified several relevant candidate genes that play a role in *J. curcas* drought response. We now aim to further study these genes and assess their role in drought responses. In this context the master student will integrate the team to produce Arabidopsis plants overexpressing the target *J. curcas* genes. The master student will obtain homozygous transgenic Arabidopsis plants carrying single insertions of the selected cDNAs. Ideally, two T2 plants with different expression levels will be selected per construct. Furthermore, the transgenic Arabidopsis plants will be fully characterized, at phenotypic and physiological levels, for their behaviour under drought stress, to give insight into the gene function.

**Tasks:**

1. Preparation of genetic constructs using the GATEWAY system to overexpress candidate genes (3-5) in Arabidopsis plants.
2. Transformation of Arabidopsis plants and selection of homozygous plants.
3. Analysis of gene expression changes of drought-responsive genes in the transgenic line and wild-type (WT) subjected to water stress.
4. Phenotypic and physiological evaluation of transgenic line and wild-type (WT) subjected to water stress.

**Techniques:**

- Preparation of genetic constructs using GATEWAY system.
- Transformation of Arabidopsis plants.
- Total RNA extraction.
- cDNA synthesis.
- Reverse Transcription-PCR and agarose-gel analysis.
- Analysis of Arabidopsis morpho-physiological parameters.

**Place:** Genomics of Plant Stress lab, Instituto de Tecnologia Química e Biológica (ITQB), Oeiras, Portugal.

**Duration:** 9 months

**Number of students:** 1

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**Bibliography:**

1. Sapeta, H., Costa J.M., Lourenço T., Maroco, J. van der Linde P. and Oliveira M.M., 2013. Drought stress response in *Jatropha curcas*: Growth and physiology. Environmental and Experimental Botany 85, 76-84.