PhD POSITIONS OFFER FORM

Position

1. IP: Antonio Leyva

2. Project Title/ Job Position title: Uncovering the molecular mechanisms of arsenic perception in plants.

3. Area of Knowledge: LIFE SCIENCES
4. Group of disciplines: Biotechnology, Bioinformatics, Food Technology, Plant Biology

5. Research project/ Research Group description (max. 2.000 characters)

Understanding the mechanisms underlying stress perception and growth adaptation to the intensity of stress is a major goal of biology. This is particularly relevant at present, since climatic models predict that crops will face severe environmental conditions, particularly extreme temperatures, drought, pests, low nutrient regimes or the sudden availability of toxic compounds. Among all toxic compounds present in the biosphere, arsenic contamination in soils and waters are particularly serious in rice, being the most important entry of arsenic in the human food chain. In our laboratory we are involved in the characterization of the molecular mechanisms underlying arsenic perception in plants. Our results uncover a complex regulatory network that tightly coordinates the amount of arsenic perceived by plants with its uptake and detoxification capacity. Our goal is the identification of a master regulator of the arsenic response critical for arsenic perception. In this project we aim to perform a systematic identification of arsenic binding transcription factors, to identify master regulators that sense arsenic. Finally, we aim to identify and characterize the corresponding arsenic orthologues in rice. The results obtained in this proposal will be a first step towards the characterization of these regulatory proteins in rice, an essential crop for feeding millions of human beings. This is particularly relevant since rice accumulates large amounts of arsenic and suffers important grain yield losses due to the presence of the metalloid. All these efforts will help to obtain new rice varieties primed to pre-acclimate to arsenic, providing efficient sustained growth in the presence of arsenic while preventing its accumulation in grain.

6. Job position description (max. 2.000 characters)

We are seeking a talented and enthusiastic student to be incorporated in a vibrant scientific environment. Our group provides an optimal environment for young and talented scientists to start an academic career in the field of life sciences. The proposed PhD project aims to understand how plants cope with arsenic, being capable of extracting

and accumulating contaminants from the environment. In particular, we aim to identify master regulators of the arsenic response involved in arsenic perception, in order to design new molecular tools to enhance or prevent arsenic accumulation in plants. We are currently identifying transcriptional regulators in the model plant *Arabidopsis thaliana* using *in silico* and genetic approaches. The PhD student, supervised by a leading scientist, will be involved in a novel proteome wide approach towards the identification of arsenic binding proteins, particularly transcription factors. Our goal will be to identify master regulators of the arsenic response involved in arsenic sensing. All these strategies, using the latest generation molecular biology and genome wide approaches will allow us to determine the applied potential of the selected regulators for phytoremediation of arsenic contaminated water.

Finally, we must mention that other research line currently running in the laboratory aims to exploit the natural diversity of aquatic plants in particular Duckweed species for purification of arsenic contaminated waters. Interestingly, Duckweed is considered not only a model plant for water phytoremediation but also a novel food with high potential to become a real alternative protein source. Therefore, the candidate will have a unique opportunity to gain experience in handling and designing new approaches to address scientific objectives using this fascinating new plant system.

Group Leader

1. Title: Senior Scientist CNB-CSIC
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4. Research project/ Research Group website (Url): Arsenic sensing and root growth. Systematic identification of arsenic binding proteins/ http://www.cnb.csic.es/index.php/en/research/research-departments/plant-molecular-genetics/leyva
5. Website description:

Mechanism underlying nutrient uptake and phytoremediation.

Plants have an extraordinary capacity to capture large quantities of nutrients and toxic compounds including heavy metals and arsenic. Arsenic can enter into the food chain through water consumption or crops (particularly rice) and therefore is considered a silent threat to public health. For the last two years we kept working on the characterisation of the molecular mechanisms involved in arsenic perception and detoxification. Recently we finished the characterisation of a ubiquitination complex involved in the degradation of the transcriptional activator of the arsenate/phosphate transporter (*Navarro et al., Molecular Plant; 2021*. We also followed different approaches to identify the key transcriptional activator of the arsenic responses involved in arsenic perception using genetic and in silico strategies. In parallel we screened an Arabidopsis collection of Iberian natural accessions for arsenic tolerance and performed a Genome-wide association study, identifying several candidate genes. Finally, here at the CNB, we performed a study of the natural variation of arsenic accumulation in duckweed, a hyperaccumulator aquatic plant with tremendous phytoremediation potential. To this end we obtained a new collection of duckweed natural accessions isolated from the Iberian Peninsula (IberLemna), in collaboration with Carlos Alonso-Blanco at the CNB.