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Postdoctoral Researcher Positions at the CBGP (UPM-INIA/CSIC)

The Centro de Biotecnología y Genómica de Plantas (CBGP, UPM-INIA) is seeking for the outstanding candidates for **postdoctoral researcher positions – Margarita Salas** fellowship, NextGenerationEU, Ministerio de Universidades. The selected candidates will apply for a 2 or 3 years stay at CBGP/UPM.

Specific candidate's requirements for all offers:

- Candidates who finished their PhD studies in the last 2 years at a Spanish public or private University, holding the PhD title between 28th July 2019, and 26th July 2021. The candidate must be in the possession of the diploma by July 27th, 2021, or a proof of payment of the taxes.
- The call is also open to Spanish candidates that got their PhDs at international Universities.
- The start date must be January 1st, 2022 to August 31st, 2022. Contract of 3 years will only be possible for candidates that start on January 1st, 2022.

TITLE: GENE REGULATORY NETWORKS CONTROLLING ROOT STEM CELLS AND ITS INTERACTION WITH LOW/HIGH TEMPERATURE STRESS

Required qualifications:

- Ph.D in plant molecular biology (last two years)
- Knowledge in bioinformatics/computational biology and confocal microscopy
- Brilliant publication record.

Task to be developed: Stem cell formation and its homeostasis is critical for plant development. We have recently defined the developmental trajectories that initiate the main tissues of the lateral root using Single Cell RNA sequencing, computational approaches and confocal microscopy (Serrano-Ron et al 2021 Molecular Plant). One of the developmental trajectories leads to stem cell formation and requires stress related regulators involved in low/high temperature acclimation. The postdoctoral researcher will contribute to profiling the intermediate transitory cell types forming (lateral) root stem cells through fluorescent activated cell sorting and RNA sequencing. This dataset will be integrated with previous datasets generated in the laboratory (such as the single cell dataset and others) and used to reconstruct stem cell gene regulatory networks and generate an organogenesis map. The effect of temperature homeostasis in the stem cell network will be evaluated in mutants (under control and stress conditions) through analysis of fluorescent marker lines and RNA sequencing determining the impact in hubs and network interactions.

Ref. Serrano-Ron L, Perez-Garcia P, Sanchez-Corrionero A, Gude I, Cabrera J, Ip PL, Birnbaum KD, Moreno-Risueno MA. (2021). Reconstruction of lateral root formation through single-cell RNA-seq reveals order of tissue initiation. **Molecular Plant**. May 29:S1674-2052(21)00189-1. doi: 10.1016/j.molp.2021.05.028.

PI of the Project: Miguel Ángel Moreno Risueño

Group website: <http://www.cbgp.upm.es/index.php/es/lineas-de-investigacion-de-jovenes-investigadores?id=101>

TITLE: MOLECULAR MECHANISMS INVOLVED IN THE INTERACTION BOTRYTIS CINEREA-HOST PLANT

Required qualifications: Experience in molecular biology, microbiology and plant-pathogen interactions will be required. Excellent communication skills in English.

Task to be developed: The postdoctoral researcher will have to construct different viral inducing gene silencing (VIGS) vectors based in a mycovirus infectious clone available in our laboratory. The VIGS vector will include fungal sequences to target genes involved in the capacity of the fungus to produce small RNAs that participate in suppressing the plant immune response. Under viral infection, the large amounts of dsRNA produced will stimulate the antiviral silencing response. Virulence will be measured to demonstrate the correct functionality of the VIGS vectors.

PI of the Project: María Ángeles Ayllón Talavera

Group website: <http://www.cbgp.upm.es/index.php/es/lineas-de-investigacion-asociadas?id=97>

TITLE: EFFECT OF ENVIRONMENTAL CONDITIONS ON THE MOLECULAR NETWORKS CONNECTING PLANT PERCEPTION AND DOWNSTREAM RESPONSES TO ARTHROPOD HERBIVORES

Required qualifications: Candidates should have experience in in vivo biotic assays using herbivores and plants. Experience in molecular biology techniques and bioinformatics analyses is required.

Task to be developed: The candidate will be involved in all the objectives of this project: Objective 1. Building and analysis of molecular networks connecting perception and response to arthropod herbivores. Objective 2. Effect of environment on the molecular networks connecting perception and response to arthropod herbivores. Objective 3. Integration of results to predict molecular consequences of climate change on plant responses to herbivory. The candidate will perform in vivo assays using plants and herbivores, as well as different molecular and bioinformatics analyses.

PI of the Project: Manuel Martínez Muñoz

Group website: <http://www.cbgp.upm.es/index.php/es/interaccion-de-las-plantas-con-el-medio?id=82>

TITLE: DECIPHERING THE STRUCTURAL AND MOLECULAR BASES OF GLYCANS PERCEPTION BY THE INNATE IMMUNE SYSTEM OF PLANTS: FROM GLYCANS RECOGNITION TO MODULATION OF PLANT IMMUNE RESPONSES AND DISEASE RESISTANCE

Required qualifications: A motivated Postdoctoral Researcher that preferentially should have expertise in biochemical and structural characterization of cell walls of plants and associated microorganisms. For example, characterization of cell wall-derived structures (glycans) from fungi/oomycete (Molecular Associated Molecular Patterns, MAMPs) or plants (Damage Associated Molecular Patterns, DAMPs), which trigger plant immune responses. Expertise in plant-microbe interactions, either using model systems (*Arabidopsis thaliana*) or crops (e.g. tomato) and in plant molecular biology will be also very valuable.

Task to be developed: The researcher will use molecular, biochemical and genetic approaches (to identify genes encoding Pattern Recognition Receptors (PRRs) perceiving glycoligands (already characterized or to be identify in the frame of the project) and downstream signaling components (e.g. *Arabidopsis* mutant screenings and genetic characterization of mutants). The characterization of the mode of action and potential activity in crops of the PRRs and downstream components identified will be also performed in the frame of the project.

PI of the Project: Antonio Molina Fernández

Group website: <http://www.cbgp.upm.es/index.php/es/interaccion-de-las-plantas-con-el-medio?id=88>

TITLE: POSTDOC POSITION IN SYNTHETIC BIOLOGY OF DEVELOPMENTAL PATTERNING AT @PLANTDYNAMICS LAB

Required qualifications:

- Knowledge of state-of-the-arts molecular biology techniques (cloning, working with microorganisms and/or plants)
- An experience with confocal and epifluorescence microscopy techniques
- Excellent knowledge of English both written and spoken
- Experience with image analysis, ImageJ scripting and R or Python programming skills are desired

Task to be developed:

- Design and construct synthetic gene regulatory pathways controlled by phytohormones (i.,e. auxin) using yeast and plants as model systems
- Design and implement new generation of direct fast biosensors for plant hormone auxin
- Perform live cell imaging using lab-on-a-chips environment to study phytohormone response dynamics in yeast and plants
- Quantify spatial-temporal dynamics of phytohormone responses, cell growth and patterning mechanisms using confocal microscopy and microfluidics
- Assist in developing computer models of hormone-driven developmental patterning through collaborations with theoreticians in the host laboratory
- Project involves active collaborations with world-class national and international leaders in plant development and hormone biology

PI of the Project: Krzysztof Wabnik

Group website: <http://www.cbgp.upm.es/index.php/es/informacion-cientifica/grupo-de-investigacion-incipiente/krzysztof-wabnik>

TITLE: POSTDOCTORAL POSITION ON COMPUTATIONAL EVOLUTIONARY GENOMICS AND MICROBIOME ECOLOGY

The group of Dr. Jaime Iranzo, studying "Evolutionary dynamics of genomes, viruses, and microbial populations" at the Centre for Plant Biotechnology and Genomics (CBGP, Universidad Politecnica de Madrid, Spain) is seeking to hire a junior postdoctoral researcher to investigate fundamental aspects of prokaryotic genome evolution and virus-host ecological interactions within human and environmental microbiomes.

Required qualifications: We are seeking a highly motivated postdoctoral researcher with strong quantitative and computational skills, and a background in computational biology, bioinformatics, complex systems, or mathematical modeling. Although not essential, some degree of familiarity with evolutionary genomics and/or population dynamics is desirable. We will positively consider candidates that add to the current set of skills of the lab and are open to collaborate with other computational and experimental groups within the CBGP.

Task to be developed: The postdoctoral researcher will join a multidisciplinary team of scientists that combine empirical data, computational tools, and mathematical models to study the ecology and evolution of microbial populations. The postdoctoral researcher is expected to develop her/his own line of research and help with supervision of undergraduate students. The details of the research project will be decided by the postdoctoral researcher and the PI based on common interests and the candidate's area of expertise.

PI of the Project: Jaime Iranzo Sanz

Group website: <http://www.cbgp.upm.es/index.php/es/informacion-cientifica/csbgp/jaime-iranzo>

TITLE: FINDING THE DOOR FOR PLANT VIRUS SEED INVASION: THE CELL WALL AS A LOCK

Required qualifications: We are looking for a motivated PhD with formation in plant molecular biology and expertise on analyses of gene expression, screening of mutants and/or generation of transgenic lines) and, if possible, on microscopy techniques, with interest to apply these skills in the field of phytopathology. Any previous experience in studying plant-pathogen interactions (particularly of plants and viruses) will be valuable.

Task to be developed:

What are we looking for: Virus seed transmission allows long-term (decades) survival and transcontinental dispersion of these major plant pathogens. Because 90% of crops are propagated through seeds, this mode of transmission is of major concern for growers and industry alike. Indeed, millions of euros are spent every year in seed health testing programmes as a way to limit the dispersion of infected seeds. Despite its importance, the molecular basis of virus seed entry into seeds are currently unknown. We have identified several genes involved in the cell wall biogenesis as potential modulators of virus seed transmission rate. The candidate will be involved in analysing the role of these candidate genes in the process of seed transmission by applying molecular tools to identify if their expression correlates with virus seed invasion. The role of the candidate genes will be also validated by studies with knock-out mutants. Finally, we will address how viruses interact with the cell wall using cell imaging techniques.

What do we offer: Our group has strong background in virology and virus evolution. During the development of the project, the candidate will acquire sound knowledge on concepts and techniques related to this area of research. Indeed, the project includes the analysis of how viruses adapt to the differential expression of cell wall genes involved in seed transmission. We are also experts in biostatistics, and the candidate will receive ample formation in this aspect. Overall, we offer a multidisciplinary formation that will complement the background of the selected candidate, resulting in a highly competitive profile.

PI of the Project: Jesús Israel Pagán Muñoz

Group website: <http://www.cbgp.upm.es/index.php/es/informacion-cientifica/grupo-de-investigacion-incipiente/virus-speciation-seed-trasmission>

TITLE: EFFECT OF SEED DEFENCE PRIMING ON PLANT DEFENCE-GROWTH TRADE-OFF ESTABLISHED UPON PLANT-PEST INTERACTION

Required qualifications: PhD in Plant Molecular Biology / Plant Physiology, knowledge in statistics and bioinformatics, strong skills in molecular biology techniques (including DNA, RNA and protein handling, PCR, qPCR...), experience on plant-biotic interaction

Task to be developed:

- Design of experiments
- Plant cultivation and arthropod maintenance
- Infestation bioassays
- Plant damage analysis (machine learning, Photoshop, Image J) and study of arthropod performance (development, mortality, fecundity)
- Molecular and biochemical techniques (RNA, DNA and protein isolation, gene cloning, plant transformation...)
- Transcriptomics (qRT-PCR, RNAseq) and metabolomics
- Data integration and statistical analysis
- Results discussion and writing articles

PI of the Project: Estrella Santamaría Fernández

Group website: <http://www.cbgp.upm.es/index.php/es/interaccion-de-las-plantas-con-el-medio?id=82>

TITLE: STUDY OF THE ROLE OF GENOMIC INSULATORS AS SITES OF MEIOTIC CROSSOVER IN PLANTS AND THEIR RELEVANCE FOR PLANT BREEDING

Required qualifications: Molecular biology background. Plant biology and/or computational biology knowledge will be positively considered.

Task to be developed: This project is a collaboration with Dr. Sara Diaz-Triviño, the leader of the Applied Bioinformatics Cluster at Wageningen University and Research. It will involve working in Wageningen University during 2022 and 2023 and a return year to Elena Caro's lab in the CBGP (2024). The candidate will have the opportunity to be trained in computational biology Artificial Intelligence and Machine Learning approaches, as well as to perform bioengineering of tomato.

PI of the Project: Elena Caro Bernat

Group website: <http://www.cbgp.upm.es/index.php/es/lineas-de-investigacion-de-jovenes-investigadores?id=103>

TITLE: CHARACTERIZATION OF THE FUNCTION OF FUNGAL EFFECTOR GENES DURING PLANT HOST COLONIZATION

Required qualifications: PhD in microbiology or plant science. The researcher will need to have a deep knowledge in plant pathogen interactions, molecular biology, confocal microscopy and/or epigenetics. Good oral and written communication skills are also required.

Tasks to be developed: The postdoctoral researcher will identify and characterize key molecular mechanisms that mediate the interaction between fungi and plants. Fungal effectors interfere with host metabolism or the immune system to facilitate host colonization. Although they frequently favour host colonization, certain plant genotypes have the capacity of recognizing fungal effectors and subsequently trigger a specific immune response that will prevent pathogen infection. Thus, effectors play an integral role in host-pathogen interactions and determine the outcome of the infection. However, despite the central role of fungal effectors, the function of most of them still needs to be elucidated. This is particularly true for the effectors of *Zymoseptoria tritici*, a major fungal pathogen of wheat. In this project we aim to identify the molecular components involved in plant-pathogen interactions and to determine their function during host colonization. Specifically, the objectives of the project are:

1. Identify new effector genes using genetic diversity from wild *Z. tritici* populations.
2. Determine the function of the identified effector genes and how do they facilitate host colonization. The identification of host targets will be pursued in this objective.
3. Elucidate the role of transcription factors and chromatin remodelling in effector gene regulation.

The researcher will design and conduct experiments to accomplish the project objectives, including mutagenesis, immunoprecipitation, infection experiments, confocal microscopy and mutant screenings. The researcher will be involved in writing manuscripts and will attend conferences. Supervision of students and participation in soft-skill courses will be possible.

PI of the Project: Andrea Sánchez Vallet

Group website: <http://www.cbgp.upm.es/index.php/es/informacion-cientifica/interaccion-de-las-plantas-con-el-medio-ipm/andrea-sanchez-vallet>

TITLE: PERCEPTION AND ADAPTATION MECHANISMS OF PHYTOPATHOGENIC BACTERIA DURING THE INTERACTION WITH THEIR HOST PLANTS

Required qualifications: Postdoctoral Researcher (PhD. in Biology, Biotechnology, Biochemistry or related areas) with expertise in molecular biology of plant-associated bacteria and in the study of plant/pathogen interactions will be appreciated.

Task to be developed: Phytopathogenic bacteria colonize plant surfaces multiplying epiphytically before entering plant tissues through natural openings or wounds to cause plant disease. Our group is interested in studying the role of bacterial perception and chemotaxis during the switch between the epiphytic to the pathogenic stage. We work with two different phytopathogenic models: the

hemibiotrophic bacterium *Pseudomonas syringae* pv tomato DC3000, the causal agent of bacterial speck in tomato and *Dickeya dandantii* 3937, a necrotroph soft-rot enterobacterium. Particularly, we are interested in the mechanisms underlying the perception and response to plant and environmental signals during the entry process and establishment of infection into the host, that is, at the onset of infection. The tasks to be developed during this project will be focused on the analysis of different biochemical and molecular aspects of the bacterial chemosensory pathways in these bacteria, including the putative cross-talk between signal transduction pathways in relation to bacterial virulence.

PI of the Project: Emilia López Solanilla/ José Juan Rodríguez Herva

Group website: <http://www.cbgp.upm.es/index.php/es/interaccion-de-las-plantas-con-el-medio?id=87>

TITLE: EVALUATION OF GENOMIC ASSISTED BREEDING TOOLS IN A PUBLIC WHEAT BREEDING PROGRAM

Required qualifications: PhD in any of the following expertise: plant breeding, quantitative genetics, statistics, mathematics.

Tasks to be developed:

- Determine the best filial generation to apply Genomic selection.
- Optimize training population for the implementation of GS in the breeding program.
- Evaluation of GS schemes and apply general benchmark guidelines for implementation of GS.
- Perform machine learning and other statistical approaches to evaluate accuracy of selection.
- Mentor and assist, as appropriate and as directed, the research graduate students in our group,

PI of the Project: Julio Isidro Sánchez

Group website: <http://www.cbgp.upm.es/index.php/es/informacion-cientifica/csbgp/julio-isidro-sanchez>

OFFER DETAILS:

Expected duration of the contract: 2 or 3 years depending on the start date.

Gross salary per month: 2,800 euros/month (12 payments) and one time 3,500 euros installation cost payment for candidates currently living out of Spain.

Start date: 1st January 2022 – 31st August 2022.

APPLICATION INSTRUCTIONS AND ADDITIONAL INFORMATION:

Application deadline: 14th July 2021

Send to humanresources.cbgp@upm.es a detailed **CV** in pdf format and a copy of the **PhD diploma**. You must indicate “**Margarita Salas CBGP**” in the subject of the email message and the **title of chosen topic**.

For any further information contact: humanresources.cbgp@upm.es

Additional information:

<https://www.boe.es/boe/dias/2021/06/04/pdfs/BOE-A-2021-9344.pdf>

About the CBGP: The mission of the CBGP (UPM-INIA) is to carry out fundamental and strategic research in plant science and in microorganisms interacting with plants. The research is focused in understanding important biological processes such as plant development, the interaction of plants with the environment and the mechanisms of plant nutrition. In addition, the CBGP is interested in developing and using computational biology tools to achieve its goals. The acquired knowledge is used to tackle major problems of the agriculture and forestry, and to develop novel technological solutions. CBGP (UPM-INIA) also has an educational role and is a reference center for training scientists and Master's and Bachelor-level students, in plant biotechnology and genomics. The CBGP (UPM-INIA) is a research institute recognized with the seal "Severo Ochoa (SO) Center of Excellence".