PLANT ENVIRONMENTAL EPIGENETICS

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PROFILE

I am a plant molecular biologist focused in plant epigenetics. I started my research career joining the group of M Carmen Martínez-Gomez (UAB) where I did my PhD studying the roles of the ubiquitous protein kinase CK2 in plants. Later I joined the group of Claudia Köhler (Swedish University of Agricultural Sciences -SLU, Uppsala, Sweden) to study genomic imprinting, an epigenetic phenomena that explains the biased expression of the maternal or paternal alleles. With the knowledge in epigenetics gained during this period, I decided to move to the study of the role of epigenetics in modulating plant responses to environmental changes. To start developing this research line I joined the lab of Jaume Martínez (initially at CRAG, Barcelona, and currently at IBMCP, Valencia) known by his expertise in plant response to light quality. After this last stage, I have been stablished as an independent researcher and started the Plant environmental epigenetics lab at the UAB.

RESEARCH

RESEARCH INTERESTS

Environmental epigenetics aims to understand how abiotic and biotic factors affect the regulation of development without directly changing the genetic code. The mechanisms underlying this regulation are chromatin-based and most of them rely on epigenetic marks, such histone modifications or DNA methylation.
In the Plant Environmental Epigenetics lab we study how epigenetics changes modulate plant growth and stress tolerance in response to environmental stimuli. Therefore, the experimental work developed is on the crosstalk between plant signalling responses and chromatin status.

STRATEGIC OBJECTIVES

Epigenetic mechanisms explain part of the plant adaptation to climate change. Although there is an increasing knowledge on the role of these mechanisms during the development, epigenetics in response to external stimuli is a poorly investigated field.
For that reason, the lab studies changes on epigenetic marks and how they are regulated in different growth conditions, mainly in the model plant Arabidopsis, but exploring other species. To gain this knowledge is crucial to generate molecular tools to obtain better adapted crops to environmental challenges.

MAIN RESEARCH LINES

With a multidisciplinary approach that includes working with epigenetic mutants, nuclei structure analysis, expression and genetic analysis, histone and transcription factor chromatin immunoprecipitation (ChIP), protein-protein interaction assays and phenotypical analysis, the group currently has two interconnected research lines:

- *Epigenetic regulation of the response to plant proximity*
In natural environments and agricultural settings plants can grow in high densities. Importantly, plants can sense proximity of other plants and respond accordingly. The cue that triggers this response is defined by the quality of the light that the plant perceives. This research line studies the epigenetic mechanisms that regulate gene expression in plants exposed to plant proximity.

- *Polycomb activity regulation in response to stress*
The role of Polycomb activity on plant development is known since long, but its participation in the regulation of genes in response to environmental changes is scarcely described. This research line explores the role of Polycomb activity (and its related histone mark H3K27me3) in the responses of plants to different environmental changes and its possible implication on epigenetic memory.

LAB FEATURED PUBLICATIONS

1. D Arias, A Ortega, C González-Calquin, LF Quiroz, J Moreno-Romero, JF Martínez-García, C Stange. 2022. Development and carotenoid synthesis in dark-grown carrot taproots require PHYTOCHROME RAPIDLY REGULATED1. Plant Physiology, 189(3): 1450–1465
doi: 10.1093/plphys/kiac097
https://academic.oup.com/plphys/article/189/3/1450/6546316

2. K Vives Hernández, J Moreno-Romero, M Hernández de la Torre, C Pérez Manríquez, D Ríos Leal, JF Martínez-Garcia. 2022. Effect of light intensity on steviol glycosides production in leaves of *Stevia rebaudiana* plants. Phytochemistry , 194, 113027
doi.org/10.1016/j.phytochem.2021.113027
https://www.sciencedirect.com/science/article/abs/pii/S0031942221003769

3. JF Martínez-Garcia and J Moreno-Romero. 2020. Shedding light on the chromatin changes that modulate shade responses. Physiologia Plantarum. 169(3):407-417
doi: 10.1111/ppl.13101
https://onlinelibrary.wiley.com/doi/10.1111/ppl.13101

4. J Moreno-Romero, AV Probst, I Trindade, Kalyanikrishna, J Engelhorn, S Farrona. 2020. Looking At the Past and Heading to the Future: Meeting Summary of the 6th European Workshop on Plant Chromatin 2019 in Cologne, Germany. Frontiers in Plant Science. 10: 1795
doi: 10.3389/fpls.2019.01795
https://www.frontiersin.org/articles/10.3389/fpls.2019.01795/full

5. MJ Molina-Contreras, S Paulišić, C Then, J Moreno-Romero, P Pastor-Andreu, L Morelli, I Roig-Villanova, H Jenkins, A Hallab, X Gan, A Gomez-Cadenas, M Tsiantis, M Rodríguez-Concepción, JF Martínez-García. 2019. Photoreceptor Activity Contributes to Contrasting Responses to Shade in Cardamine and Arabidopsis Seedlings. Plant Cell. 31(11):2649–2663.
doi: 10.1105/tpc.19.00275
http://www.plantcell.org/content/31/11/2649.long