Spain

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Please describe any new experimental resources and/or software tools available to Arabidopsis researchers that have been initiated or funded in your country in 2020 or early 2021

• Crisanto Gutiérrez's lab (CBM, Madrid) has developed a highly useful tool (PlaCCl), a unique sensor with three fluorescent reporters that allows spatiotemporal visualization of cell cycle progression and works in a variety of organs (Desvoyes *et al*, 2020, Nature Plants 6, 1330-1334)

• A work led by A. Carbonell (IBMCP, Valencia) presents two different strategies based on artificial sRNAs that can be used to finely modulate the degree of silencing of endogenous and exogenous target genes (López-Dolz L *et al*, Nucleic Acids Res. 2020, 48, 6234-6250).

Please provide a paragraph describing the general impact of the COVID19 pandemic on the scientific community in your country

As many other countries, Spain has been badly hit by COVID-19, with severe restrictions in mobility and in the capacity to access workplaces for months. This has had an understandable negative effect on the progress of many projects, with the reduced bench hours, the loss of biological material and the uncertainty of working conditions and its subsequent impact on planning. Possibly, the situation has been particularly stressful for those researchers working under pressure to advance their careers in a finite time framework (aspiring PhD candidates close to term, young postdocs on fellowships or trying to acquire international experience, young PIs at early stages of their careers, etc.), but fortunately some measures have been taken by Spanish funding agencies and universities/research institutions to mitigate some of these problems. However, these problems have been general consequences of the pandemics, not particularly worse for the Arabidopsis community.

In fact, the Spanish scientific production focused on Arabidopsis research has been very similar to that of previous years, and hopefully, the overall impact in this aspect will be minimal. On the other hand, Spanish Arabidopsis researchers have a strong tradition of international collaborations that have been more difficult in this context, but again, this should be easily overcome if the situation improves as expected. On the bright side, the pandemics has reinforced to a certain point public trust and interest in science and, while still biomedical research is perceived as the most important, all fields should benefit of this awareness and, hopefully, will be translated into new and better funding instruments in the next years.

Planned events for 2021 and 2022

In Nov 2020, the XV National Meeting of Plant Molecular Biology, a major event bringing together most of the plant labs in Spain, and specially the Arabidopsis community, was held online with a high level of participation and scientific quality. In the next years, several meetings have been planned, some of them postponed from 2020, hoping for the chance of in-person attendance. This volatile scenario has caused that, for some of them, the precise details of the organization (dates, location, program) are still missing.

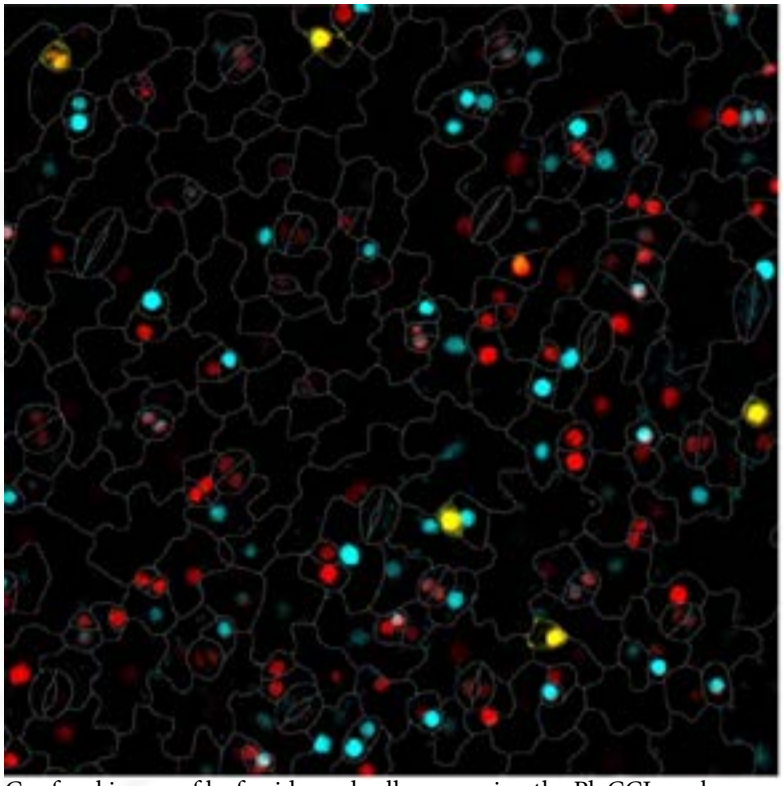
•BP2021: XXIV Reunión de la Sociedad Española de Biología de Plantas and XVII Congreso Hispano-Luso de Biología de Plantas, 7 y 8 de julio de 2021. Online. https://bp2021.eu/

•"Understanding plant responses to climate changes: redox-based strategies" organized by L.M. Sandalio, F van Breusegem, F.J. Cejudo. 21-23 September, 2021. Baeza, Spain

•"Joint Meeting for Plant and Human Sulfur Biology and Glucosinolates ", organized by C. Gotor y L.C. Romero, 26-30 September, 2021, Sevilla, Spain. https://www.s-bio-glucosinolate2020.com/index

•"Workshop in Molecular Mechanisms controlling flowering", organized by C. Ferrándiz and F. Madueño. Expected June 2022, location to be announced.

•International Plant Proteostasis Meeting, organized by V. Rubio, F. Theodolou, B. Orosa and M. Trujillo. Madrid, 2022, exact dates to be announced.As for outreach, the Arabidopsis community is present in many initiatives, for instance:The cycle of conferences "Qué sabemos de…", organized by CSIC; Fascination of Plants day activities; etc.



Confocal image of leaf epidermal cells expressing the PlaCCI marker, which contains in a single construct pCDT1a::CDT1a-eCFP, pHTR13::HTR13-mCherry and pCYCB1;1::NCYCB1;1-YFP. This allows simultaneous identification of cells in different phases of cell cycle: G1 in cyan, S+earlyG2 in red and lateG2+M (prophase and metaphase) in yellow. The marker is described in Desvoyes *et al*, 2020, Nature Plants 6, 1330-1334.

Selected Publications

•Chen WW, Takahashi N, Hirata Y, Ronald J, Porco S, Davis SJ, Nusinow DA, Kay SA, Mas P. A mobile ELF4 delivers circadian temperature information from shoots to roots. Nature Plants, 6:416-426.

A highly interesting study that opens new views on clock functioning and how a long-distance shoot-to-root dialogue works and transmits information of ambient temperature to the underground organs.

•Esteve-Bruna, D., Carrasco-López, C., Blanco-Touriñán, N., Iserte, J., Calleja-Cabrera, J., Perea-Resa, C., Úrbez, C., Carrasco, P., Yanovsky, M. J., Blázquez, M. A., Salinas, J., & Alabadí, D. (2020).

Prefoldins contribute to maintaining the levels of the spliceosome LSM2-8 complex through Hsp90 in Arabidopsis. Nucleic Acids Research, 48, 6280–6293. Prefoldins were originally identified as aids for actin and tubulin folding in the cytosol, but new regulatory roles of these proteins in the nucleus are being uncovered across kingdoms. In this work, a novel function of prefoldins in regulating mRNA splicing is described

•Laureano-Marín AM, Aroca Á, Pérez-Pérez ME, Yruela I, Jurado-Flores A, Moreno I, Crespo JL, Romero LC, Gotor C. (2020) Abscisic Acid-Triggered Persulfidation of the Cys Protease ATG4 Mediates Regulation of Autophagy by Sulfide. Plant Cell: 32:3902-3920

Autophagy is a key process for the degradation and recycling of cytoplasmic components in eukaryotes, which plays a crucial role in plant growth and stress responses. This work sheds new light on how hydrogen sulfide regulates this process in conjunction with abscisic acid.

Major Funding Sources

In Spain, Arabidopsis research is mainly funded by the State Research Agency in competitive calls launched every year. In 2020, around 75 projects to individual laboratories were granted, which is in line with previous years.

Additional national calls and regional funding also supports other initiatives.PLANTGROWTH, a large individual competitive grant from the ERC AdG program to Crisanto Gutiérrez (CBM, Madrid) is active since 2019, focusing on understanding and exploiting genome replication, cell division and epigenetics to design improved plant growth strategies.European funding for basic plant research is usually scarce, but several MSCA actions (IF, RISE, etc) have been awarded to Spanish fellows to work in Arabidopsis.