Subproductos Agroalimentarios: del Residuo al Coproducto

1. Información del Grupo de Investigación:
   - PLANT HORMONAL REGULATORY NETWORKS
   - Centro de Biotecnología y Genómica de Plantas (UPM – INIA)
   - Departamento de Biotecnología
   - PI: Dr. Stephan Pollmann (stephan.pollmann@upm.es)
   - Co-Workers: Beatriz Sánchez Parra (beatriz.sanchez@upm.es)
     Marta Marina Pérez Alonso (martamarina.perez@upm.es)
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     María Casas López (maria.casas@upm.es)

2. Líneas de investigación en las que se está trabajando actualmente.
   My main research interest currently focuses on the phytohormone-dependent regulation of plant growth and development. Plants possess a highly complex network of chemical signaling compounds that govern plant responses to their ever-changing environment. In this network, different substance classes and compounds, respectively, like for instance gibberellins, cytokinins, and brassinosteroids, but also abscisic acid and ethylene play crucial roles. In addition, auxins with indole-3-acetic acid (IAA) as its major representative in plants, and the octadecanoids, comprising the signal molecules jasmonic acid (JA) and its biosynthetic precursor 12-oxo-phytodienoic acid (OPDA), play a pivotal role in the regulation of plant development and organogenesis.

   Goal of my current research is the elucidation of regulatory mechanisms and underlying signal transduction pathways, which are capable of controlling a large number of different functions on a phytochemical basis. At present, my lab is pursuing both the complete elucidation of auxin biosynthesis in Arabidopsis thaliana and the disclosure of auxin – jasmonate interactions in the framework of stress responses of plant roots on a genetic, molecular biological, enzymatic, as well as on a mass spectrometric level. Herein, a Systems Biology approach is in the focal point of my interest, combining our genetic approaches with the transcriptomics and metabolomics datasets obtained in my laboratory.

   In order to base my work on a broader foundation, I recently contributed to the foundation of a collaborative research group with several national colleagues, e.g. Prof. Dr. Jesús Vicente Carbajosa (Technical University of Madrid) and Dr. Joaquín Medina Alcazár (Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria), that is fostered by the Technical University of Madrid.

   Within this network, we are collaborating with the internationally renowned Bioinformatics group of Prof. Dr. Stefano Boccaletti (Centre for Biomedical Technology (CTB-UPM)/Institute for complex Systems (ISC-Firenze)).

   Beyond that, we are currently working on a collaborative project that aims at the genetic optimization of crop plants for subsequent industrial processing. We launched a bioenergy project on the optimization of lignocellulose extraction from Solanaceae plants in 2012, which I currently coordinate.
3. Proyectos que se están llevando a cabo actualmente en las correspondientes líneas de investigación.

Dr. Stephan Pollmann has been principle investigator in more than ten different national and international projects. Most of the projects have been funded by national or international grant agencies such as the German Science Foundation (DFG) or the Spanish Ministry of Investigation and Innovation (MICINN). In other cases, the PI contributed to contracted research projects with globally acting biotechnology companies, i.e. Bayer Crop Science, BASF Plant Science and REPSOL. Projects led by Dr. Stephan Pollmann over the last five years are given in the following:

1. Optimized lignocellulose exploitation from Solanaceae canopy. REPSOL – UPM INSPIRE program, REPSOL S.A., P120050357 (2013-2015). Coordinator: Dr. Stephan Pollmann, Co-PIs: Dr. Julia Kehr, Dr. Joaquín Medina, Dr. Jesús Vicente
2. Genetic and molecular dissection of the routes implicated in the biosynthesis of auxin. MICINN, BFU2011-25925 (2011-2014) PI: Dr. Stephan Pollmann
3. Molecular enzymology of octadecanoid signal compound biosynthesis in *Arabidopsis thaliana*. DFG, PO1214/3-2 (2009-2012) PI: Dr. Stephan Pollmann
4. Analyses on the physiological role of an environmental stress-induced tyrosine decarboxylase from *Arabidopsis thaliana*. DFG, PO1214/4-1 (2009-2010) PI: Dr. Stephan Pollmann

4. Palabras clave de la investigación que se desarrolla, así como, el Código Unesco.
Bioquímica (2303)
Biología Molecular (2415) – Biología molecular de plantas (241502)
Biología vegetal (2417) – Desarrollo vegetal (241715) y Fisiología vegetal (241719)

5. Relaciones con otros grupos de investigación.

- Relaciones con grupos de Organismos Públicos
  1. **Dr. Uwe Drüge**, Leibniz-Institute of Vegetable and Ornamental Crops, Erfurt, Germany
  2. **Dr. Roberto Solano**, Centro Nacional de Biotecnología (CNB-CSIC), Madrid, Spain
  3. **Dr. Pilar Cubas**, Centro Nacional de Biotecnología (CNB-CSIC), Madrid, Spain
  4. **Dr. Joaquín Medina**, Centro de Biotecnología y Genómica de Plantas (UPM - INIA), Madrid, Spain – Associate member of the UPM Research Group: Regulatory Networks in Plant Development and Plant Stress Responses
  5. **Dr. José Manuel Colmenero**, Instituto de Recursos Naturales y Agrobiología (IRNASE) – CSIC, Sevilla, Spain
  6. **Dr. Christine Böttcher**, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Plant Industry, Adelaide, Australia

- Relaciones con Unidades de investigación de Empresas
  1. **Dr. Klaus Grossmann**, BASF Agricultural Center Limburgerhof, Limburgerhof, Germany.

- Relaciones con grupos de Universidades
  1. **Dr. Jesús Vicente**, Centro de Biotecnología y Genómica de Plantas (UPM - INIA), Madrid, Spain – Member of the UPM Research Group: Regulatory Networks in Plant Development and Plant Stress Responses
  2. **Dr. Ingo Dreyer**, Centro de Biotecnología y Genómica de Plantas (UPM - INIA), Madrid, Spain – Member of the UPM Research Group: Regulatory Networks in Plant Development and Plant Stress Responses
3. Dr. Julia Kehr, University of Hamburg, Hamburg, Germany – Former member of the UPM Research Group: Regulatory Networks in Plant Development and Plant Stress Responses
4. Dr. José Palacios, Centro de Biotecnología y Genómica de Plantas (UPM - INIA), Madrid, Spain
5. Dr. Luis Gómez, Centro de Biotecnología y Genómica de Plantas (UPM - INIA), Madrid, Spain
6. Dr. Luis Rubio, Centro de Biotecnología y Genómica de Plantas (UPM - INIA), Madrid, Spain
7. Dr. Oscar Lorenzo, Centro Hispano Luso de Investigaciones Agrarias (CIALE), Salamanca, Spain
8. Dr. Miguel Blázquez, Instituto de Biología Molecular y Celular de Plantas (UPV-CSIC), Valencia, Spain
9. Dr. Jutta Ludwig-Müller, Technical University of Dresden, Dresden, Germany
10. Dr. Eckhard Hofmann, Ruhr-University Bochum, Bochum, Germany
11. Dr. Franck A. Ditengou, University of Freiburg, Freiburg, Germany
12. Dr. Frank Ludewig, University of Cologne, Cologne, Germany
13. Dr. Jurrian Ton, University of Sheffield, Sheffield, Great Britain
14. Dr. Henrik Aronsson, University of Gothenburg, Gothenburg, Sweden
15. Dr. Steffen Reinhothe, University Joseph Fourier, Grenoble, France
16. Dr. Nathalie Guivarc'h, University François Rabelais, Tours, France
17. Dr. Markus Geisler, University of Fribourg, Fribourg, Switzerland
18. Dr. Oliver Berkowitz, Murdoch University, Murdoch, Australia
19. Dr. Yunde Zhao, University of California at San Diego, San Diego, USA
20. Dr. Jürgen Kühn, Technical University of Dresden, Dresden, Germany
21. Dr. Thomas Brodbeck, University of Freiburg, Freiburg, Germany
22. Dr. Frank Ludewig, University of Cologne, Cologne, Germany
23. Dr. Philosophy Zerbe, University of British Columbia, Vancouver, Canada

6. Resultados más relevantes de la Investigación en los últimos cinco años.
   - Publicaciones:


7. Equipos e Instalaciones Científicas.

The CBGP offers several laboratories for Research Services, which are located on the lower floor of the main building, and include Radioisotope, Microscopy, Genomics and Proteomics laboratories, a Physcomitrella growth unit and facilities for working under anaerobic conditions. Research Services laboratories occupy a total of approx. 500 m². Moreover, the CBGP can now fall back onto a fully equipped Metabolomics Service laboratory that was established and is at present headed by Dr. Stephan Pollmann. The Metabolomics Unit is equipped with two state-of-the-art mass spectrometers that enable both metabolite profiling and absolute quantification of trace elements. Research Auxiliary Services include: Central glassware and sterilization facility (70 m²), Stock room (135 m², including a dedicated cold room), Main building plant growth facilities (150 m²), Freezer room (110 m²), water purification (type II distributed; type I on demand), as well as compressed research gases and liquid nitrogen supplies. General Services include: Meeting rooms (5, 190 m² total), Seminar room (110 m²), Library (100 m²), Administration rooms (200 m²), ICT and servers (50 m²) and Cafeteria (100 m²).

8. Internacionalización.

- Proyectos aprobados y en curso dentro del Programa Marco de I+D de la UE (Título del Proyecto y países participantes)
  A SYSTEMS BIOLOGY APPROACH TO DISCLOSE AUXIN SYNTHESIS IN PLANTS (SysBioAux)
  European Commission, Marie Curie Career Integration Grant, FP7-PEOPLE-CIG-2011 303744 (2012-2015) PI: Stephan Pollmann