ANUAL REPORT
INSTITUTO DE BIOTEcnología VEGETAL

UNIVERSIDAD POLITÉCNICA DE CARTAGENA

2016
During 2016, several important events occurred at the Instituto de Biotecnología Vegetal (IBV). The former director, Professor Francisco Artés Calero, resigned from his position as he retired from his job full professor to become emeritus. After the new elections, I assumed the direction with several new developments ahead.

From the early days, the IBV comprised seven research units. After the request of a group of colleagues from soil sciences, a new unit of Ecology and Soil Biotechnology, was created as part of the Institute in December 2016. It has five new scientists, Prof. Angel Faz, Prof. José Álvarez Rogel, Dr. Héctor Conesa, Dr. Raúl Zornoza and Dr. Martín Soriano.

While the IBV has been located at the I+D+i building since 2009, our quest has been to relocate to the Alfonso XIII campus. Finally, in 2016 the Rectorate included the IBV in the major plan to restructure the Alfonso XIII campus. Pending economical assignments, we should be relocating in the foreseeable future.

The Consejería de Empleo Universidades y Empresa opened a call to give formal training to students graduated from the professional training program and the IBV benefited from those initiatives that were open in 2016 and started in 2017. Becoming a center for professional training has been an important step.

Altogether during 2016 the scientific output and extramural funding obtained by the different units maintained the levels of previous years. We expect to increase our capacity in the future implementing further our philosophy of cooperation, both for problem solving and in grant applications and research and development projects.

Marcos Egea Gutiérrez-Cortines

Full Professor of Genetics

Director Instituto de Biotecnología Vegetal
**Description of main results**

Five articles have been published in international journals (LWT-Food Science and Technology; Frontiers in Microbiology-Section Food Microbiology; and Food Engineering Reviews) with high impact factor (first quartile), and 3 patents have been submitted. In international congresses, 4 communications have been presented to the VIII Iberian Congress / VI Ibero-American Congress of Refrigeration Sciences and Technologies - CYTEF 2016 (Coimbra, Portugal) and to the VIII International Postharvest Symposium: Enhancing Supply Chain - ISHS 2016 (Cartagena, Spain).

1. **Projects**


2. **Papers**


3. **Others**


Staff: Antonio López Gómez, Asunción Iguz Gainza, Sonia Soto Jover, María Ros Chumillas, Domingo Miranzo Navarro, Javier Maté Sánchez de Val, M. José Sánchez; Laura Navarro, Laura Buendía
Description of main results for the Unit this year
The Unit received financial support during 2016 from two research projects, both of them from the Spanish Government, and from one contract with a food company. Four articles were published in indexed journals. One thesis was also defended in this period.

1. Projects

2. Papers

3. Others


SECONDARY METABOLITES

Description of main results
New data were acquired on the involvement of secondary metabolites in plant responses to stress. Compounds with notable antioxidant capacity are differentially accumulated in tissues as a function of the level of stress supported by plants. Analyses of both types and contents of stress metabolites make it possible to discriminate between species populations in a relatively small area by relating metabolite profiles to soil properties. This knowledge could be applied on several different fields, from phytomanagement of polluted areas to production of high added-value metabolites in controlled conditions.

1. Projects

2. Papers

3. Others
Research stay at University of Amsterdam. From March to June. Researcher: Antonio López Orenes
Research stay at University Campus Bio-medico di Roma. From January to April. Researcher: M. Ángeles Ferrer

Staff: Antonio A. Calderón, M. Ángeles Ferrer, Antonio López Orenes, Matías López Serrano
Description of main results for the Unit this year
New data on different fields, for example, in the use of new emerging technologies or in the development of new and functional products as vegetal smoothies or juices. Some results are:

• The use of a continuous microwave, high power/short time, provided the best quality in vegetables smoothies.
• The identification in walnut and almonds, of physiological markers of oxidative stress called phytoprostanes.
• Fashion watermelon juice enriched in L-citrulline diminished muscle soreness perception after a half marathon race.
• UV-C and hyperoxia abiotic stresses can improve healthiness of some vegetables.
• The use moderate high pressure homogenization treatments for functional food supplements, in particular when they are rich in thermolabile bioactive compounds.

1. Projects
Innovative processing of natural refrigerated fresh vegetables smoothies improving its healthiness. MINECO.
Principal investigator: Artés-Hernández, F.
In vivo study, in athletes of half marathon, of the intake of watermelon juice to know its potentiality as functional drink. Principal investigator: Aguayo, E.
Comprehensive use of the carob pod in the elaboration of functional foods. Principal investigator: Martínez, A.

2. Papers

3. Others
- Ph.D. Dissertation: High homogenization pressures in nutraceutical products with high functional value.
- Ph.D. Dissertation: Effects of continuous microwaving on the overall quality of tomato-based smoothies.
- Ph.D. Dissertation: Identification and quantification of phytoprostanes in nuts as markers of oxidative stress.

**Description of research interest and main results**

The way genetic programs and environmental factors such as light and temperature affect plant development are studied. Organ growth and secondary metabolites, specifically volatiles are also analyzed. A system based on machine learning (ML) algorithms and computer vision for automatic phenotype data analysis has been developed. New progress in understanding the common coordination of organ growth and secondary metabolism have been obtained.

1. **Projects**


2. **Papers**


Weiss, J., Alcantud-Rodríguez, R., Toksöz, T., Egea-Cortines, M. 2016. Meristem maintenance, auxin, jasmonic and abscisic acid pathways as a mechanism for phenotypic plasticity in *Antirrhinum majus*. Scientific Reports 6,19807 doi:10.1038/srep19807

**Staff:** Marcos Egea Gutiérrez-Cortines, Julia Weiss, Victoria Ruiz-Hernández, Raquel Alcantud-Rodríguez, Claudio Brandoli, Fernando Pérez, Marina Martos-Fuentes, Marta I. Terry
RESISTANCE TO INSECTICIDES

GFP expression in Nicotiana bethamiana leaf with a ToLCNDV replicon.

Description of main results
The resistance to pesticides of Myzus persicae was studied. Several populations were collected from the main Spanish peach production areas. Those populations were resistant to carbamates (pirimicarb) and pyrethroids (lambda-cyhalothrin), and susceptible to the rest of the insecticides, except some populations that were highly resistant to neonicotinoids.

Biotechnological tools based on Tomato Leaf Curl New Delhi Virus (ToLCNDV) have been developed. Last year, an infectious clone of ToLCNDV was designed and validated and later, a replicon based on the virus sequence was designed. This replicon may allow high expression of heterologous proteins in Solanaceae and Cucurbitaceae.

The UV-C dose for inducing postharvest lemon’s defence against Penicillium digitatum was optimized. New plant–pathogen interactions in crops and in postharvest were described for Rhizopus sexualis in pumpkins, Aspergillus carbonarius in persimmons, Elsinoë australis in pomegranates, and Stemphylium vesicarium in spinach.

1. Projects


Estudio de sistemas innovadores de reducción de podredumbres. Mejora de la calidad e identificación de patologías poscosecha. SAT 9821 GRUPO CFM. 2016 – 2017. Principal investigator: Martínez, J.A.


Identificación e aislados de Alternaria sp. causantes del corazón negro de frutos de granado y estudio de sus implicaciones parasitarias sobre diversas variedades de granado. Viveros Caliplant, Murcia. 2016 – 2017. Principal investigator: Martínez López, J.A.


2. Papers

3. Others
Martínez, J.A. is a new member of working research group GECQRF-SEF – Control Químico de Enfermedades y Desarrollo de Resistencias a Productos Fitosanitarios, belonging to SEF - Sociedad Española de Fitopatología.

The collection of microorganisms of Agriculture, postharvest and sustainability (MAPYS) of Universidad Politécnica de Cartagena is now associated to REDESMI – Red Española de Microorganismos (www.redesmi.es).

Staff: Pablo Bielza, Josefina Contreras, Dina Cifuentes, Juan A. Martínez López, César Petri, Carolina Grávalos, Marí A. Parra, Lidia Martín, Ana Belando, Virginia Balanza, María Martínez, José E. Mendoza, Inmaculada Moreno
Description of main results for the Unit this year
During 2016, the Genetic Resources Unit have continued working on the conservation, characterization and evaluation of genetic resources, mainly in the framework of the two existing Projects, one financed by the European Commission and the other one by the Ministerio de Economía y Competitividad of the Spanish government. In the same way, the staff of the Genetic Resources Unit have carried out the annual recollection of indigenous wild plant material and their conservation in the Germplasm Bank-UPCT.

1. Projects


2. Papers


Staff: Sebastián Bañón Arias, Encarnación Conesa Gallego, Catalina Egea Gilabert, Juan Esteva Pascual, José A. Franco Leemhuis, Juan A. Fernández Hernández, Juan J. Martínez Sánchez, María José Vicente Colomer, Virginia Sánchez Navarro, Almudena Giménez, Eulalia Martínez Díaz, Marina Martos Fuentes
A COMPLETE LIST OF PUBLICATIONS CAN BE SEEN AT:
Publications - 2016