

**PLAN DE ACTUACIÓN
ACTUATION PLAN**

Plan Actuación 2018-2021

ESTACION EXPERIMENTAL DEL ZAIDIN

EEZ

Versión 1.1. 14 de noviembre de 2019

1. Datos Generales / General Data



Código del Centro / Center Code:	090201
Tipo Centro / Center Type:	Centro Investigación
Titularidad / Ownership:	Propio
Áreas Científicas / Scientific Areas:	Ciencias Agrarias
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Constituido por / Established by:	
Integrado por / Integrated by:	
Departamentos / Departments:	DPTO DE BIOQUIMICA, BIOLOGIA CELULAR Y MOLECULAR DE PLANTAS DPTO DE FISIOLOGIA Y BIOQUIMICA DE LA NUTRICION ANIMAL DPTO DE MICROBIOLOGIA DEL SUELO Y SISTEMAS SIMBIOTICOS DPTO DE PROTECCION AMBIENTAL
Unidades Asociadas / Associated Units:	CELL SIGNALING AND METABOLIC INTEGRATION (339P00) FENOTIPADO CON TECNICAS DE IMAGEN Y ESTUDIOS DE DESARROLLO ESTOMATICO PARA ANALISIS DE ESTRES VEGETAL

2. Reseña Histórica / Historical Outline

2.1 Origen / Origin

Fecha de Constitución / Foundation Date: 04/05/1955

Entidades Fundadoras / Founder Entities: Prof. José Ibañez Martín, President of CSIC

Primer Director / First Director: Prof. Enrique Gutiérrez Ríos

2.2 Objeto con el que fue creado / Founding aim

The Institute was created with the aim of carrying out scientific research on soil and plants.

2.3 Reseña histórica extendida / Extended historical outline

Estación Experimental del Zaidín (EEZ), which belongs to the Spanish Council for Scientific Research (CSIC), is an upward and dynamic research Centre with an extended scientific history. Although it was officially established on May 4th 1955 with the aim of carrying out research on soil and plants, its origin dates back to 1940 when Granada was chosen as one of the perfect locations to achieve one of the overall objectives of the CSIC: to expand its scientific activities all over Spain.

At that time, the creation of the different research Sections devoted to specific scientific objectives was based on the different Chairs occupied by the young Professors that had recently arrived at the University of Granada (Faculties of Sciences and Pharmacy). In 1946 the two first Sections, devoted to Chemistry-Physics and Agricultural-Chemistry, were created under the leadership of Prof. Enrique Gutiérrez Ríos and Dr. Ángel Hoyos de Castro, respectively. These two sections were dependent on Patronato Alonso de Herrera and were linked to the Institute of Edaphology and Plant Physiology of the CSIC in Madrid. Two additional sections were added in 1949 focusing on Soil Microbiology and Plant Physiology, under the supervision of Prof. Vicente Callao Fabregat and Dr. Luis Recalde Martínez, respectively. In 1951 the first structure of the EEZ, which would set the basis for the future institute, was completed with a new section working on Analytic Chemistry under the direction of Prof. Fermín Capitán García.

To bring together the different sections dispersed among the different Faculties of the University of Granada, the CSIC acquired in 1950 a building, later known as Casa Blanca (White House), and its surrounding grounds (about 2250 m²), located next to the currently known as Avenida de Cervantes. This new building became operative in 1953 and was fully occupied by the sections mentioned above throughout 1954. Two years later, the EEZ's emblematic building, known as *Casa Amarilla* (Yellow House) was purchased to foster new laboratories and administrative facilities.

The first Director of EEZ as an Institute of the CSIC was Prof. Enrique Gutiérrez Ríos who remained in this position until 1957. A new Section named Mineralogy of Clays, with Prof. Juan Luis Martín Vivaldi as Section Head, was added to the Research Structure of EEZ in 1957.

Prof. Ángel Hoyos de Castro was Director of the Institute from 1957 to 1961. In 1958 the new Section of Animal Physiology was created under the supervision of Prof. Gregorio Valera Mosquera. This was a very important decision for the future development of EEZ since animal studies extended the original aim of focusing research mainly on plants and soil. In 1961 Dr. Luis Recalde Martínez was appointed Director of the Institute and remained in this position until 1979. During this period the structure of EEZ was enlarged with the incorporation of two new sections, one devoted to Mineralogy of Soils, with Prof. Miguel Delgado Rodríguez as Head, and the second to Agrometeorology, supervised by specialists from other organisms. A section on Statistics, coordinated by Prof. Dr. Alfonso Guiraum Martínez, was also established based on a Service that had been previously created in 1957.

The early sections that were created throughout the history of the EEZ changed with time and new Sections started to function in 1970: Biochemistry, with Prof. Federico Mayor Zaragoza as Section Head, and the Laboratory of Botany, with Prof. Fernando Esteve Chueca as Supervisor. The construction of a new building known as Casa Roja (Red Building) began in the early 70s and became operational in 1976. The former sections were re-organized into Structural Units, and nine Units were established: Physical-Chemistry and Mineral Geochemistry; Edaphology and Botany; Plant Physiology; Agricultural

Chemistry; Phytopathology; Microbiology; Plant Biochemistry; Animal Physiology; and Analytical Chemistry. Under the Direction of Prof. Manuel Lachica (1979-1983) EEZ celebrated its XXV anniversary in 1980.

Prof. Dr. Julio Boza was the following Director from 1983 to 1989. In that period the CSIC began to redefine its research lines and its objectives focusing more on biological aspects, basically Animal, Plant and Microbes. Prof. José Miguel Barea Navarro was Director of the Institute from 1989 to 1998. In this period the internationalization of the research carried out by the Institute took place and several research groups at the EEZ managed to obtain grants from the different programmes developed by the EU, which strengthened the scientific structure (personnel, equipment and publications) of the Institute. The nine Structural Units were re-organized into five Departments: Agroecology and Plant Protection; Biochemistry, Molecular and Cellular Biology of Plants; Soil Microbiology and Symbiotic Systems, Animal Nutrition, and Earth Sciences and Environmental Chemistry.

Prof. Juan Luis Ramos Martín became Director of the Institute in 1998 and remained in this position until 2007. In 1998 the Department of Animal Nutrition moved from the main central Headquarters of the EEZ to a new building in Armilla, a nearby town only 4 Km away from Granada. In 2002 different emblematic buildings started being renewed and the construction of a new "Casa Blanca" to replace the former one, began. This new building was inaugurated in May 2005, together with a new Auditorium. Coinciding with these events, the 50th anniversary of EEZ was celebrated with the assistance of the President of CSIC, Prof. Carlos Martínez and Prof. Federico Mayor Zaragoza, ex-Director of UNESCO. New greenhouses were also constructed replacing the old ones and other buildings were adapted for new uses such as the library, additional laboratories, plant growth chambers, kitchenette, etc. This period of the EEZ can be considered one of the most unrestrained for both infrastructure and the incorporation of scientific personnel, mainly due to the development of the 2005-2009 Strategic Plan enforced by the CSIC. In the frame of this Strategic Plan, EEZ was again reorganized in March 2007 within the following departments: Biochemistry, Cell and Molecular Biology of Plants; Microbiology of Soil and Symbiotic Systems; Environmental Protection; and Environmental Geochemistry. The Environmental Geochemistry Department decided move out of EEZ and join Instituto Andaluz de Ciencias de la Tierra (IACT) to develop a new and stronger Centre devoted to Earth Sciences, circumstance which was completed in winter 2010.

Prof. Dr. Nicolás Toro García was director of EEZ since March 2007 to October 2013. He was in charge of the development of the 2005-2009 and 2010-2013 Strategic Plans. In Strategic Plan 2014-2017 EEZ was structured within the following departments: Departments of Biochemistry, Cell and Molecular Biology of Plants; Microbiology of Soil and Symbiotic Systems; Environmental Protection; and Physiology and Biochemistry of the Animal Nutrition, whose objectives and development were integrated within those of the EEZ in the Strategic Plan. New infrastructure was added to EEZ, i.e., a laboratory building that had been occupied by the Department of Microbiology of Soil and Symbiotic Systems. A cafeteria has also built and the building occupied in Armilla by the Physiology and Biochemistry of the Animal Nutrition Department was expanded. In May 2011, the First Centenary of the Yellow House was celebrated.

Prof. Dr. José Manuel Palma Martínez became director of EEZ in November 2013 until February 2014 when Dr. Matilde M. Barón Ayala, the current Director of EEZ, was named. During her period as Director she has undertaken the task of supervising the rebuilding of "Casa Roja". New laboratories, offices and common spaces will come into use in 2018. Dr. Matilde Barón is also designing to put into practice the new 2018-2021 Strategic Plan. In 2017 the "Granada, Science and Innovation City" consortium was created with an active participation of the EEZ.

The research objectives of the EEZ fit well among those considered as top priority by the National Scientific Research and Technology Programmes, EC Programmes, Basic Science Research Programmes, Regional Government Research Plans and CSIC Strategic Research Plans.

3. Organización / Organization

Descripción: Organigrama, Comités asesores externos, Estructura departamental, Líneas de investigación, etc / Description: Organization chart, Steering Committees, Department structure, Research Lines:

Estación Experimental del Zaidín (EEZ) is a research Centre that belongs to the Spanish Council for Scientific Research (CSIC). The Centre's science programme focuses on Agricultural Sciences and is structured in different Departments. EEZ has the following Organizational Structure: 1. The Executive Board (EB) of EEZ is responsible for major executive and political decisions including those dealing with long-term Strategic Planning. 2. The Centre's Governing Board (CGB) assists the Director of the Centre in all scientific and administrative issues. The Department Heads, Vicedirectors and Manager are present in the CGB, as well as four independent representatives chosen by all the personnel. The CGB meets monthly to increase the speed of decision making, implementation and communication. 3. The Scientific Senate (SS) assists the Director of the Centre in major scientific policies and long-term Strategic Planning. The SS holds a general meeting once a year to debate the general situation of the Centre and extraordinarily when it is necessary to analyze relevant organizational and scientific issues. 4. The EEZ's Scientific Departments are the following: Biochemistry, Cell and Molecular Biology of Plants; Microbiology of Soil and Symbiotic Systems; Environmental Protection; and Physiology and Biochemistry of the Animal Nutrition. The Head of Department leads each of the scientific departments that are integrated by different research groups which vary in size. A Group Leader is responsible for each of the research groups. 5. The Scientific Services provide support to the research activities carried out at the Centre, both at the EEZ's main premises, supervised by specifically appointed staff scientists. The Scientific Services at EEZ are the following: Scientific Consulting on Agricultural Science Area Library Assessment, Restoration and Protection of Mediterranean Agrosystems (SERPAM) Greenhouses and Plant Growth Chambers Radiochemistry Laboratory Confocal and Transmission Electron Microscopy (CTEM) Carbon and Nitrogen Elemental Analysis Service Scientific Instrumentation Service (SIS) Lyophilized Service DNA Sequencing Service (DSS) Service of Vehicles Fleet for Scientific Fieldwork. 6. The Administrative and Technical Services, headed by the Centre's Manager, include: Information Technologies Service (ITS) Purchases and Stockroom General Management Human Resources Grant Management Unit Maintenance, Repairs and Conversion Work Payments Office Apart from these Services, we would like to highlight our Scientific Culture and Innovation Unit (UCC+i), in charge of the science outreach activities, and the Knowledge Transfer Unit.

4. Análisis DAFO / SWOT Analysis

4.1 Debilidades / Weaknesses

1. Personnel

- Low incorporation rates of young researchers during the Strategic Plan 2014-2017, partly due to restricted funding.
- Ageing of research staff. The average age of researchers with permanent positions is now around 53.
- Low technicians/researchers ratio in most of the groups.
- Scarce promotion perspectives for scientists, technicians and administration personnel.
- The Science Outreach Service lacks specific personnel, while the work load has constantly increased, being done mostly by the Director and one Vicedirector.
- Few technicians with required qualification for animal care and experimentation.

2. Low participation in EU programmes

- Most groups at EEZ have experienced difficulties in obtaining EU funds in the course of the 7 Framework and H2020 Programmes (<10% success rate in the last 3 years).
- Lack of administrative personnel with good English level and specific training to detect opportunities and provide support in the preparation and management of EU grants.

3. Knowledge transfer activity

- Although efforts were made during the previous Strategic Plan to increase the number of patents and favour technology transfer (Programme RECUPERA 2020 with 12 projects at EEZ, participation in operative groups of the Regional Development Plan, research and advisory contracts with private companies), the ability to attract companies and obtain funds from R&D contracts is limited to some groups.
- Lack of personnel with adequate background to identify sources of private funding, to increase the number of contracts and agreements with other innovation agents.

4. Recruitment of PhD students and postdoctoral fellows

- It is difficult to recruit postgraduate students with competitive academic records. The need to co-finance their contracts reduces the hiring opportunities, as not all groups are able to cover the expenses. The number of PhD students interested in continuing a scientific career in Spanish or foreign laboratories has also descended over the last years. ·The limited opportunities for the development of scientific careers have discouraged potential postdoc researchers (i.e., Ramón y Cajal programme) to opt for their incorporation to EEZ. This, and the ageing of scientific staff has debilitated the institute.

5. Collaboration between research groups

- Limited joint research initiatives between EEZ groups despite the existence of obvious potential synergies. The CSIC evaluation system discourages collaboration between groups from the same Institution.

6. Administration

- Absence of a common organizational structure for all CSIC Institutes.
- Lack of appropriate informatics tools for agile and efficient administration.
- Lack of specific training for particular working positions.
- Lack of clear, standard protocols for administrative purposes. Those existing are imposed without consulting the Management teams at the Institutes.

4.2 Amenazas / Threats

1. Human resources

- Continuous loss of scientific staff (-11% in the last 3 years). The expected retirement of 8 senior scientists in 2018-21 can compromise the centre's objectives unless new positions are available to replace them.
- Constant decrease in the number of postdocs, graduate students and technicians due to lower public funds and the interruption of CSIC Programmes (JAE). The required co-funding (e.g. 8000 € for an early postdoc) limits the development of groups.
- CSIC does not offer permanent positions for RyC scientists, while nearby Universities do guarantee their

future careers. This complicates attracting these young scientists to EEZ.

- Limited career promotion chances for scientific, technical and administrative personnel.

2. Scientific activity

- Continuous changes in the schedules for national and regional grant calls hamper designing a long term research strategy in the groups.

- Insufficient support for new scientists to set up their own research groups.

- Researchers are often involved in grant coordination both at the scientific and administrative levels, with excessive paperwork and ever increasing bureaucracy.

- Lack of the flexibility required for scientific activity: the processes for personnel recruitment, financial management and acquisition of infrastructure (even computers) are overly rigid, time-consuming, and often unaffordable.

3. H2020 and other international funding sources

- Difficulty in obtaining EU funds due to high competition and the specificity of H2020 topics, often outside the research activities of EEZ.

- The complex application processes, the need for lobbying strategies, and the intricacy of grant management, discourage scientists to compete for EU grants.

- Many bilateral programmes have been discontinued, placing at risk international collaboration.

4. Technology transfer

- Despite the agricultural potential of Andalusia there is little interest from biotechnology, agriculture development and environmental management companies to invest in R&D.

- Low institutional support, restrictive conditions and few advantages for the creation of spin-off companies.

- Institutional criteria for the assessment of patent applications are sometimes extremely restricting.

5. Animal experimentation facilities

- The urban development of surrounding areas jeopardizes the current animal housing and experimentation facilities and their future expansion. An experimental farm at an appropriate distance could help to overcome this drawback.

6. Administration

- Heavy workload from different institutions, with frequent changes in procedure, protocols and contact persons.

- Diversity of calls with changing economic justification.

7. Low political weight of the CSIC in the R&D management system of the Andalusian Community.

- The CSIC delegation in Seville provides limited support in terms of institutional relationships with the regional government or updated information about agreements, calls, funding instruments, and grants follow-up.

4.3 Fortalezas / Strengths

1. Multidisciplinarity and scientific production

- Consolidated research lines with multidisciplinary approaches supported by 19 groups with excellent scientific production (>140 publications/year) and well integrated in their national and international context.

- EEZ is ranked 22 of the 122 CSIC centres according to the Scimago Institution Rank 2016, which includes those that published over 100 papers indexed in Scopus in the last year (46 CSIC centres meet this requisite).

2. Equipment and Scientific Services

- Modern equipment has been recently acquired to increase our capacities: UPLC/MS/MS, portable GC-MS, Q-TOF detector, vibratome and automatic platforms for microscopy samples, two new qPCR machines, spectrophotometers and a fluorescence/luminescence plate reader. The equipment available at

the Scientific Services is an advantage to execute projects involving -omics techniques. The Instrumentation Service has high level specialists in chromatography and mass-spectrometry, offering a wide range of protocols.

3. Infrastructure

·The building known as Casa Roja (3973 m²) will be renewed during 2018-2019. Although this implies a difficult period for several groups, once finished the updated building will house new laboratories with modern facilities and will also expand the current laboratory space. This will favour the growth of the institute and could attract young scientists to the EEZ.

·Facilities for plant growth under controlled conditions are available to all the groups and can be hired by external users. EEZ has 11 greenhouses and 11 growth chambers (3 more will be purchased in 2018).

·Several laboratories, greenhouses and growth chambers are certified as biosafety level 2 facilities.

·Modern, versatile facilities to carry out experiments with productive animals that can cover demands from public and private sectors.

4. Internationalization

·Extensive network of collaborations with research groups from many different countries. EEZ is also present in multilateral networks with European, African and South American partners.

·The Soil Science and Plant Biology International Course organized annually at EEZ is a way to attract foreign postgraduates.

·Many EEZ scientists are members of the Editorial Boards of international journals and belong to different international scientific committees.

5. High training capacity

·In the frame of our agreements with the University of Granada and other national and international Universities, EEZ takes part in many post-graduate and Masters courses (Biotechnology is among the "top 5" in Spain). Around 12 PhD theses and 40 Masters' final dissertations are defended each year. In addition, EEZ hosts ERASMUS+ and other international students via programmes like i-COOP or EMHE.

·In collaboration with professional schools, EEZ offers training for laboratory technicians.

6. Administration

·Experienced personnel with great adaptive capacities, balanced distribution of tasks and flexibility in their organization.

4.4 Oportunidades / Opportunities

1. Socio-economic demand for research results.

·Given the growing social awareness with respect to the negative impact of global climate change, the use of fertilizers and phytosanitary products in agrosystems, and dietary strategies to decrease the environmental impact of livestock production, there is an increasing demand for quality plant and animal-derived food products, agricultural sustainability and environmental protection, providing new opportunities for the different research lines at EEZ.

·Health related issues associated to food and diet are an increasing concern for society. Some research groups can contribute to respond to this concern and become authoritative sources for science-based information.

2. Interaction with agricultural, technological and industrial sectors.

·The new EU regulations on fresh chemical-free horticultural products and increasing inspections will force farmers in the region to make considerable changes in their current practices by using environmentally-safe methods to control pests, diseases and weeds instead of other less green methods. This should generate new opportunities for groups at EEZ to collaborate with companies in the biotechnology and agriculture sectors and to transfer technology generated at EEZ. At the same time, the present context of high cost of animal production systems, mainly due to the high price of animal feedstuffs along with the ban to use antibiotics as growth factors, open wide opportunities of collaboration for the animal nutrition groups with animal additive, feeding companies and other productive sectors.

·The high costs of maintaining their own R&D departments by SMEs could favour the externalization of their R&D activities and benefit EEZ.

·The experience gained in the Recupera 2020 projects can be exploited for future public-private innovation initiatives.

Enhanced visibility and institutional weight can be obtained by increasing the presence of the EEZ in activities of the International Agri-Food Excellence Campus (CeIA3), and the International Excellence Campus CEI-BioTic.

3. Granada has been granted the "Science and Innovation City" distinction by the Spanish government. This will enable us to apply for Smart Cities projects (H2020) and can strengthen the collaboration between local companies and institutions and the EEZ.

4. Agreements with the Government of the province (Diputación) favour applying for joint EU projects, enable the use of its experimental farms and the provision of animals for groups working on animal nutrition.

5. The absence of calls from the Andalusian Government for research projects in the last Strategic Plan period caused a reduction in the centre's funding opportunities. However, the new Andalusian Plan for Research, Development and Innovation (PAIDI 2020), recently approved, should offer new chances to apply for research grants and other joint projects with private companies (i.e. operative groups for agri-food innovation).

4.5 Ventajas Selectivas / Selective Advantages

1. EEZ is currently the largest research centre within the Area of Agricultural Sciences in the CSIC. Research covers all five sub-areas in this area, and several groups are developing activities and have accumulated expertise in topics in the interface with other CSIC areas, such as Natural Resources, Biomedicine, Chemistry or Food Technology. Hence, EEZ represents a leading Centre within the CSIC capable of tackling new challenges within the Area with an innovative perspective and offering unique and highly demanded capabilities.

2. The multidisciplinary character of the scientific research carried out at EEZ, integrating different areas of knowledge along with the existence of modern equipment operated by specialists and a wide range of technologies, places the Centre at an excellent position to significantly contribute to crucial basic scientific information in the fields of plant and microbial biology, to unravel animal nutritional and metabolic related issues, and to the development of new strategies in sustainable agriculture and environmental protection.

3. The EEZ is located in a unique scientific environment, where it can play a leading role: There are five CSIC institutes in Granada and its metropolitan area, EEZ being the largest. This, and the solid relationship of EEZ with the University of Granada, the Health Sciences Technological Park (PTS) and other local institutions, places the institute at an excellent position to act as a central node to establish solid networks and relevant links with academic, industry and social stakeholders.

4. The new Grassland and Mediterranean Silvopastoral Systems Service is unique in the entire CSIC and probably in Spain. It will bring an opportunity to attract funds from regional and local administrations from the whole mediterranean region.

5. Objetivos y Estrategias / Objectives and Strategies

5.1 Objetivos Generales / General Objectives

The overall objective of the EEZ is to carry out cutting edge research that increases scientific knowledge and to respond to the increasing demand for sustainable and environmentally-friendly agriculture and farming, taking also into account food- and environment-related health aspects, as well as animal well-being. The improvement of crop production and food quality products from plant and animal origins, while minimizing environmental impact will be achieved by covering different, yet overlapping research areas that involve many aspects of Agricultural Sciences and Plant, Animal and Microbial Biology, often close to the boundaries with other areas (Biomedicine, Natural Resources, Chemistry, or Food Technology). Ultimately, we intend to be a reference center in our scientific fields by maintaining high quality publication standards, establishing international research networks and synergies, and offering training and career development opportunities to young talents. The approach to tackle these global objectives will combine fundamental research essential to expand the current body of knowledge regarding key aspects of agricultural systems, and the development of applied or close-to-application strategies that will allow the transfer of knowledge into the productive sector. Complementary to these general objectives, the centre has a strong commitment with the communication of research results and scientific information to society, and with the training of high quality PhD students and post-doctoral scientists in the different research lines of the Centre. The human aspects and the good scientific practices in research are important at EEZ. We have a clear policy on non-discriminatory treatment of the differences in any aspect (gender, sexual orientation, disabilities, etc.), always promoting comradeship. The research carried out complies with the principles of ethics, animal welfare and safe laboratory practices. Our needs as far as technical support personnel in research groups are concerned, are similar to those of any other research lab and even more so in labs of biological orientation. The technical support/scientific personnel ratio should be 1. To reach it we would need to incorporate 24 technicians. If we observe the recruitment trend over the 4 years (2014-2018), we would need 30 G1 technicians and 9 G3 technicians to cover our current needs. We have obtained these figures by adding the hiring period (in months) of all G1 and G3 and in each case, we have divided it by 48 months (4 years). All EEZ research groups have calculated their needs for support personnel for the 2018-2021 period and it ascends to 29 people (17 G1, 1 G2 and 12 G3). The DNA Sequencing Service and the Microscopy service have only 1 part-time technician. The technician at the Radiochemistry laboratory will be retiring in 2019 and would need to be replaced. It would also be of the utmost importance to have a technician in the Greenhouse Service, especially considering that the Institute is specialized in plant-growth research and associated microorganisms. EEZ is highly active in scientific outreach activities and has its own Scientific Outreach Unit that operates in the Institute; however it has no personnel to develop those activities. The work is done mainly by the great efforts of the Direction of the Institute, the Vice-directors and some volunteer scientists and technicians. For this unit to be fully operative we would need a G1 support technician with a background in biology. This new personnel would undoubtedly take the Outreach and Communication activities of our Institute one step further. In Administration, we need 3 staff members as managing personnel (level 24) for Internationalization, Knowledge Transfer and Human Resources. The need to cover these positions is imperative. Regarding profiles for the future CT, we have recently sent to the Area Coordination 3 profiles for the OEP 2018: - Physiology and Biochemistry of the Reproduction and Stress in Plants of agronomic interest. - Rumen Microbiome: Nutrition and Environment - Biotechnology of Bacteria with agronomic and environmental interest. For the period 2018-2021 we need 9 CT positions (including the fore mentioned 3). We will define the other 6 profiles in the near future. Regarding Thematic Interdisciplinary Platforms (PTIs in Spanish), some researchers and research groups are included in XYLELLA and SOILBIO. There are also different initiatives to create new PTIs about Plant Phenotyping, Animal/Plant Microbiome, Climatic Change, Fruits as Health Source, Gene Expression Regulation and Biotechnology, Sustainable livestock production, Nutritional and Functional Evaluation of Food Proteins and other topics. One of the main objectives of the EEZ is to respond to the increasing demand for sustainable and environmentally-friendly agriculture and farming, taking also into account food- and environment-related health aspects, as well as animal well-being. These are related with Sustainable Development Goals such as: No Poverty, Zero Hunger, Good Health and Well-being for People, Responsible Consumption and Production, Climate Action, Life on land. Complementary to these general objectives, the centre is strongly committed with the communication of research results and scientific information to society, and with the training of high quality PhD students and post-doctoral scientists in the different research lines of the Centre. The centre disseminates the potential and the social, economic and ecological importance of the research activities with different strategies focusing on: 1) policy-makers, private companies and farmer associations, 2) general public, 3) primary, secondary and graduate students, 4) science for the physically handicapped and 5) women in science. This fits within the following goals: Quality education, Reducing inequalities, Gender equality. We have been awarded with a Distinction of Gender Equality from CSIC President in 2018. The activity of the EEZ is within the global area of LIFE, with interactions with the area SOCIETY (sustainability of ecosystems) and is laterally related to the area MATTER (nanomaterials, sensors for precision agriculture, etc). The improvement of

crop production and food quality products from plant and animal origins, while minimizing environmental impact will be achieved by covering different, yet overlapping research areas that involve many aspects of Agricultural Sciences and Plant, Animal and Microbial Biology, often close to the boundaries with other areas (Biomedicine, Natural Resources, Chemistry, or Food Technology). We develop outreach in common with CSIC Institutes from SOCIETY and MATTER areas: European Researcher Night, Science and Technology Week, International Women Day, Science in the City, etc.

5.2 Actuaciones Generales Propuestas / Proposed General Actuations

Most of these actions will be oriented to obtain the Severo Ochoa Center of Excellence Accreditation, to preserve the scientific quality of EEZ, to maintain a critical mass of young talented scientists and to improve the financial situation of EEZ. With this in mind, the following actions will be undertaken: Research will be focused on societal challenges (sustainable agriculture and farming, climate change, environmental pollution, crop protection against adverse conditions, food quality and security) and innovation, while enhancing high quality basic research on the biology of animals, plants and microorganisms, global health and development of new biotechnologies to protect the quality of ecosystems. Collaboration among the different groups will be favoured with the aim of obtaining the Centre of Excellence Accreditation and gain strength for future grant calls. Collaboration with other research centres of reference will be enhanced. Visibility will be increased to obtain external funding and disseminate job opportunities, according to the actions detailed in this Plan. Technology Transfer will be highly supported to increase the income through license agreements and the exploitation of scientific services, research infrastructures and technical consultancy. The training of EEZ researchers in innovation and entrepreneurship will be favored. Communication with different national and regional institutions (Ministry of Agriculture and Environment (MAPAMA), regional administration, etc.) will be strengthened to identify potential funding instruments and working areas that need further research. EEZ will exploit the whole spectrum of funding instruments and mechanisms to recruit young researchers and support personnel. The necessary steps with the local institutions and the regional government will be taken to set up a new experimental farm for the Department of Biochemistry and Physiology of Animal Nutrition. Services The Scientific Instrumental Service (SIC) will be enhanced with new equipment obtained through national and regional programs. The three technicians working at the SIC will attend at least one training course per year to be constantly updated in the new techniques that they will use. The Microscopy and Sequencing Services will establish alliances with similar services in the city, in particular with the University of Granada and with the Institute of Parasitology and Biomedicine "López Neyra" belonging to the CSIC. Through these actions EEZ researchers will have more and better options when carrying out research on DNA sequences, i.e., diversity experiments or microscopy techniques (applied to all research lines at EEZ). The Greenhouse and Growth Chamber Service will be modernized and further implemented with new growth chambers thanks to the rebuilding of "Casa Roja". A technician with a permanent position will need to be recruited for this Service. The new Assessment, Restoration and Protection of Mediterranean Agrosystems will establish frequent contacts with the regional and local administrations to meet their demands and obtain funds from them. The new Consulting Service for the Agricultural Science Area will create opportunities to collaborate with administrations, farmers, agrofood companies, etc. Administration Reinforce the Grant Management Unit to expand funding opportunities and improve the success rates in competitive fund raising. More specialized staff to ease increasing bureaucratization and reduce the researchers' paper load. Create and implement software to better control and keep track of the researchers' internal administrative tasks that are not covered by SAICI, i.e., software program for purchase orders, for vehicle requests and reservations, for chambers and greenhouse requests and reservations, for animal facilities reservations Periodic meetings with grants and contracts management agents within the Andalusian Community to deal with emerging problems, novelties, etc. when managing projects and to unify criteria. Ongoing participation of our administrative personnel in international project training management and language courses. CSIC will be asked to implement alternative ways to the Centralized Purchase System for the Public Sector, i.e., travel & accommodations, acquisition of informatics equipment and office material, etc.). The system is slow and inefficient. Actions related to Outreach, Technology Transfer, Internationalization and Training are described in other parts of the Strategic Plan. NOTE: The implementation of the proposed Strategic Plan 2018-2021 will depend significantly on direct public funding (salaries, running costs, infrastructure) and support from CSIC, along with the obtainment of sufficient competitive funds from regional, national and international sources. It would be necessary for CSIC to restore the JaeDoc, JaePre and JaeTec programs and expand multinational programs

5.3 Objetivos Científicos / Research Objectives

The scientific objectives focus on the following areas: 1) Research on plant biology and responses to abiotic and biotic stresses, including tolerance, regulatory and signaling mechanisms, gene expression changes, plant physiology and reproduction; the biological role and medical implications of pollen allergens and the study of antioxidants and other bioactive compounds with a potential impact on human health are also emerging areas of relevance. 2) The study of plant interactions with beneficial and pathogenic microorganisms to understand the physiological and molecular mechanisms underlying

microbe-plant interactions; unveiling the roles, adaptation and survival strategies of microorganisms in the environment; analysis of ecology, physiology, molecular biology, molecular genetics, and genomics of soil and plant-associated bacteria, arbuscular mycorrhiza and rhizospheric fungi. 3) Analysis of the impact of plant microbiota and soil microbial diversity on plant growth, health and distribution; the influence of microorganisms on plant tolerance and resistance to abiotic and biotic stress and their application in biotechnological processes and in biofertilization, biodegradation and biocontrol strategies to improve the sustainability of agrosystems and environmental quality; pursuing the protection of soil, water and agricultural crops through the development of biotechnological methods to remove pollutants and to recycle agricultural and urban wastes; developing integrated methods to fight against crop pests and diseases. 4) The study of animal nutrition in terms of nutrient and energy metabolism and their impact on performance and product quality, and then on consumer health; diet requirements of livestock breeds of economic and social relevance in different physiological and environmental conditions; the search for non-conventional economic and healthy alternatives in arid ecosystems with a lack of pastures and conventional raw materials; the biological effects of chemical fractions, bioactive compounds and metabolic modifiers in food and their impact on animal and human health; the influence of the diet on animal metabolism and rumen microbiota, and the environmental impact of ruminant production.

5.4 Actuaciones Científicas Propuestas / Scientific Proposed Actuations

- Creation of an External Advisory Council to guarantee the future excellence of the research and technological activities carried out at EEZ
- The Scientific Advisory Board will be maintained, with regular meetings. It should act as a non-political “think tank” to assist the Executive Board in finding new funding niches, definition of strategic research lines, etc.
- Recruitment of new researchers (2 per department during the PA period).
- Recruitment of new lab technicians to reach the ratio 1/1 scientist/technician. Additional specialized personnel will be employed for Animal facilities and Greenhouses.
- Improve and renew scientific equipment at EEZ Services and other equipment for common use.
- Implement new research lines according to the European Framework Programs for Research and Innovation, National and Regional Research Plans.
- Create synergies and promote the convergence of EEZ research lines.
- The renovation of the building known as “Casa Roja” (3973 m²) during 2017-2019 and the new laboratories with modern facilities, will favor specific campaigns to attract young scientists (for example RyC candidates) to EEZ. Lab space and offices for new young researchers will be offered.
- Organization of yearly internal meetings focused on one of the main research areas in the EEZ with an international invited speaker.
- Hire a bioinformatics expert.
- Strategies will be designed to encourage EEZ researchers to publish in high impact journals and to prepare press releases associated to publications.

5.5 Objetivos de Transferencia de Tecnología / Technology Transfer Objectives

- We will establish a closer connection between the Knowledge Transfer and the Science Outreach Services. The aim will be to design a communication strategy to expand the visibility of our research in the productive sector, in order to search for new interactions between EEZ and the technological and industrial fields. - Social awareness with regards to the negative impact of global climate changes should allow us to exploit the interest on our research on agricultural sustainability and environmental protection. - Interactions with agricultural and biotechnological (seed, breeding, food and livestock) companies, should be increased to facilitate technology transfer and know-how to the productive sector. - Special attention will be placed on direct knowledge transfer through the promotion of sustainable agriculture together with the registration (patents, intellectual property) of novel procedures derived from fundamental studies. - Collaboration with other agricultural research institutions, such as IFAPA or INIA, will be encouraged. - Participation in technology transfer programmes/initiatives (operative groups, innovative public purchase, etc.) from the Andalusian Government (JA) and other institutions will be encouraged. The experience gained through the Recupera 2020 projects should help in this objective. - Periodic meetings with the Agency IDEA (JA). - Increased interaction with the Health Sciences Technological Park (PTS). - Periodic update and distribution of the catalogue of EEZ's knowledge transfer capacities, which is available both on-line and as a printed document. - Identification of local demands and encouragement of suitable EEZ research groups to match them.

5.6 Actuaciones en Transferencia de Tecnología / Technology Transfer Proposed Actuations

It will be necessary to recruit an additional person with dual expertise on research and business for the Knowledge Transfer Unit to satisfy the increasing needs of our research groups to establish new

relationships with industrial and other institutional partners. This will not only alleviate the load in terms of paperwork for contracts, agreements and property protection, but also facilitate the presence of the institute in national and international technology events (workshops, fairs, forums).

Periodically, we will organize one-day meetings with agricultural, food and biotechnology companies and associations, each focused on one particular problem or sector. For example, in 2018 we have already planned two workshops, with the support of a financial entity (Bankia): one oriented towards the olive sector and one to horticultural producers.

As part of a marketing campaign, mailing lists will be created for the periodical distribution of a catalogue of our knowledge transfer capacities.

The CSIC Foundation will be asked to give financial support for new “proof of concept” projects.

New partnerships and funding opportunities will be sought by the following means:

- Signing of an agreement with the Health Sciences Technological Park (PTS) to strengthen our relationships and search for new collaborations, with the concept of global health in mind.
- Our current agreement with Diputación de Granada (local government) will be an instrument to collaborate with local entities, to identify new potential partners in the productive sector and to further funding opportunities at the European level.
- The “Granada, Science and Innovation City” consortium will also offer new opportunities for knowledge transfer given the presence of the main federations of companies in Granada.
- Meetings will be organized with financial entities and R+I corporations and platforms to explore new funding niches.
- Identify ideas and technological developments suitable for technology transfer projects. Create a database of EEZ IDEAS.
- Potential new ways of financial support for specific actions will be explored (crowdfunding, donations).

5.7 Objetivos de Formación / Training Objectives

- Thanks to the existing agreements with the UGR and other Universities and the signing of new ones we will promote an increase in the number of Bachelors' and Masters' final research-based dissertation works carried out at EEZ. - Full implementation of ForDoc-EEZ, a training program specifically designed for our predoctoral students, which includes workshops, seminars and a one-day session where they present their research projects (the first edition was held in December 2016). - Use of already existing agreements with JA and new ones (FP Dual, with private schools) for the training of technicians. - Development of new measures to attract/recruit both national and international post-doc and graduate students. - Integration of Erasmus-Mundus students into the Soil Science and Plant Biology International Course.

5.8 Actuaciones Propuestas en Formación / Training Proposed Actions

Although some of the actions are included in the objectives, additionally we propose to:

- Increase the visibility of the EEZ to attract talented PhD students, through outreach activities and extracurricular training in collaboration with Universities.
- Sign new agreements with Spanish universities for Masters and Bachelor's degrees and with other institutions for the training of technicians.
- Periodically update the Welcome Package with information for newcomers.
- Improve the EEZ web page with the necessary academic and practical information related to PhD programs, Health and Safety information for PhD students, etc.
- Develop new postdoctoral and predoctoral training programs through seminars and scientific meetings according to the center's research program to favor interdisciplinary formation.
- Promote the participation of researchers, technicians and administrative personnel in training courses.

5.9 Objetivos de Divulgación / Outreach Objectives

The centre will disseminate the potential and the social, economic and ecological importance of the research activities with different strategies focusing on: 1) policy-makers, private companies and farmer associations, 2) general public, 3) primary, secondary, and graduate students, 4) science for the physically handicapped, 5) women in science: 1-2) The agenda for 1 and 2 will include meetings, conferences, seminars, participation in social events, increased collaboration with newspapers and

magazines, the generation of booklets, videos about our research activity exploiting Internet technologies and social networks (Twitter, Facebook, blogs). 3) A special educational programme called Ciencia BaSe has been recently developed at EEZ, targeting high school students. It includes mentoring activities, providing advice in the choice of future careers, as well as developing hands-on science or outreach projects. 4) A model Plant Biology Workshop for blind and deaf-blind people was developed in the last year, funded by FECYT. It will be further adapted with new research topics done at EEZ and to other kind of handicapped people. 5) "Coffee talks" with primary and secondary school students and women scientists; scientific talks in Book Fairs and other cultural events, etc. The Science Outreach Service has lacked any hired or permanent personnel during nearly the last two years. The priority here will be to have a professional responsible for these activities (a journalist of a science divulgator).

5.10 Actuaciones Propuestas en Divulgación / Outreach Proposed Actuations

Some of the actions are included in objectives.

The main priority will be to recruit new personnel. This is essential for the independent and efficient functioning of the Science Outreach Unit and to fulfill the proposed activities. We will request that a permanent position for the service be included in the future public employment offer of the CSIC. Meanwhile, we will keep on trying to obtain a temporary position from the "Technical Support Personnel" calls.

The Science Outreach Unit will increase its links with the Knowledge Transfer Unit to make our science accessible to the productive sector, as one of our priority target audiences. Marketing campaigns will be designed to increase the visibility of the science done in the institute at the local, national and international levels. This includes completing the English version of the webpage and making it fully operational. A campaign will also be carried out to show the institute's commitment with the ethical aspects of science and well-being of experimental animals.

The Science Outreach Unit will have a 50 m² laboratory available in the renewed "Casa Roja" building. It will be used to carry out workshops and demonstrations, mostly with High School students, and to hold Masters' practical courses. New small equipment will have to be purchased to take full advantage of this facility.

Once the new "Casa Roja" is fully operational, a small building known as "the bunker" will be free to use. We intend to renovate this space to hold an EEZ Science museum, which will include a historical overview of the institute; an "ancient laboratory corner", with small equipment from the 1950's-70's; the collection of lyophilized specimens; and a section dedicated to applied technologies developed by the EEZ. The museum will be part of the tour in future student visits to EEZ and can be opened to the general public on specific events (European Researchers' Night, etc.). Funds will be requested from FECYT and other instances for the necessary repairs of the building and the development of the museum.

The institute will actively participate in all of the outreach initiatives carried out by the "Granada, Science and Innovation City" consortium.

5.11 Objetivos de Internacionalización / Internacionalization Objectives

- We will promote collaboration and interaction with laboratories and universities in other countries, encouraging our staff to participate in international consortia. - Participation in discussions and preparations for the next (9th) Framework Programme, most likely to cover the period 2021 – 2027. - The Unit of Research Projects in the Administration will be improved to favour these international activities. This includes recruitment of personnel specifically trained to detect opportunities and provide support in the preparation management of EU grants. - Search for contacts in countries of emerging interest for research. - Participation in international networking opportunities, such as the Global Forum for Innovation in Agriculture. - Foreign PhD and Post-doctoral students should also be attracted, as well as candidates for Tenure Staff positions. - Science outreach strategies will be implemented to publicize the activities done at EEZ in international forums, i.e., AECE (Spanish Foreign Office), Bilateral Programmes, EU Programmes, etc. Lack of personnel has hampered the development of the English version of our webpage, but this should be a priority to increase international visibility.

5.12 Actuaciones Propuestas en Internacionalización / Internacionalization Proposed Actuations

Although some of the actions are included in objectives, additional actions will be implemented to:

- Encourage and support EEZ scientists to apply for funds from national and international agencies, in particular those concerning European H2020 programs and the grants issued by the European Research Council.
- Support the organization and attendance to preparatory meetings to build up H2020 consortia.
- Maintain an updated database of international funding opportunities.
- Establish agreements with international institutions to foster the exchange of scientists for training and research purposes. Besides European partners, special attention should be posed on Latin American countries and emerging scientific niches in Asia.
- Seminars with invited speakers from international research institutions, with a particular focus on those that may lead to active collaborations.
- Improvement of the EEZ web site, highlighting in an attractive format the International activities undertaken through H2020 (and other) projects and case studies (YouTube videos, euronews format...) of successful collaborations with the industrial sector.
- Promote, and ask for support from the central CSIC instances for the organization of international workshops by EEZ scientists.

6. Indicadores de Seguimiento (Objetivos Cuantitativos) / Monitoring Indicators (Quantitative Objectives)

6.1 Objetivos Cuantitativos / Quantitative Objectives

(Información no disponible)

7. Grupos de Investigación / Research Groups

7.1 Grupos de Investigación / Research Groups

ANTIOXIDANTES, RADICALES LIBRES Y ÓXIDO NÍTRICO EN BIOTECNOLOGÍA Y AGROALIMENTACIÓN (ARNOBA)

Especialización

A4. Ciencias Agrarias

A4.2 Biología, bioquímica y fisiología vegetal

LS - LIFE SCIENCES

LS1 Molecular and Structural Biology and Biochemistry

4. Biotechnology

4.2. Biotechnology-based industrial processes

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.2. Sustainable and competitive agri-food sector for a safe and healthy diet

Investigadores Principales

PALMA MARTINEZ, JOSE MANUEL

Objetivos

Desde su inicio en 1983, el grupo orientó sus objetivos al estudio de los antioxidantes y la señalización celular por especies de oxígeno y nitrógeno reactivo (ROS y RNS) en plantas de interés agronómico. Sin renunciar al desarrollo de investigación básica, la actividad del grupo está comprometida también con una investigación aplicada en pos de una transferencia de conocimiento hacia el tejido productivo. Tras un periodo fecundo de generación de conocimiento, hemos acumulado un cuerpo de doctrina con potencial explotable en los campos de la biotecnología y la agroalimentación. Los objetivos específicos son: 1. Estudio de la fisiología de frutos de interés agrícola. Se investiga fundamentalmente la maduración y post-cosecha de frutos de pimiento, tomate y olivo, mediante el análisis de antioxidantes enzimáticos y no enzimáticos. Igualmente se determina la participación del óxido nítrico (NO), ROS y RNS en dicho procesos. Se estudia, asimismo, la influencia de estas moléculas en los parámetros de calidad de los productos. Para abordar este objetivo se emplean frutos completos o bien preparaciones de fracciones subcelulares, principalmente peroxisomas, y se siguen abordajes transcriptómicos, proteómicos y metabolómicos. 2. Función del NO y RNS en la germinación, desarrollo y estrés abiótico en plantas superiores. Se lleva a cabo la caracterización bioquímica y molecular de las dianas celulares endógenas (proteínas, lípidos y ácidos nucleicos) implicadas en los procesos de nitración y S-nitrosilación propiciados por RNS y el análisis de su participación en procesos de señalización celular durante la germinación y el desarrollo, y en estreses abióticos (salinidad, daño mecánico, baja/alta temperatura, metales pesados como el Cd, y metaloides como el As). Se emplean plantas modelo como Arabidopsis y guisante, pero también pimiento, tomate, trigo, arroz y olivo, y se investiga el uso de bio-marcadores inducidos en dichas plantas en respuesta a las condiciones de estrés mencionadas. Estos abordajes contribuirán al desarrollo de estrategias y herramientas de aplicación biotecnológica que permitan regular los procesos de germinación y desarrollo, así como la obtención de plantas más tolerantes frente a distintos estreses abióticos. 3. Prospección de compuestos bioactivos naturales procedentes de productos hortofrutícolas con aplicaciones nutricionales y biotecnológicas. Dada la evolución del grupo, este objetivo se orienta a los sectores alimentario y biotecnológico. Se investigan nuevos componentes bioactivos (capsaicina, proteínas y/o péptidos, flavonoides, etc.) y antioxidantes de tomate, aceituna y pimiento con efectos beneficiosos para la salud, aplicados bien a través de terapias biomédicas o de dermofarmacia. Asimismo, en conexión con el sector productivo, nuestro grupo lleva a cabo la caracterización y selección de variedades de productos hortofrutícolas especialmente ricas en antioxidantes, con vistas a mejorar su competitividad en los mercados. Estos objetivos se engloban en el área global de VIDA, si bien no se encuadran en ninguna de las plataformas ya existentes. Consideramos que, por el perfil del grupo, compartido por un buen número de grupos del CSIC, se podría iniciar una nueva PTI basada en los FRUTOS COMO FUENTE DE SALUD. Con respecto a la iniciativa de ciencia en abierto, entendemos que el CSIC debería de ser partícipe de la misma, sin que ello repercuta en la financiación de los grupos de investigación. Se estima que la mayor parte de los recursos pecuniarios provendrán de proyectos nacionales o autonómicos, a cuyas convocatorias ya han concurrido los miembros del grupo. El grupo sustanciaría su actividad con la incorporación de: - 1 científico (plantilla) - 1 post-doc - 1 pre-doc - 1 técnico, grupo 3

This group started in 1983 and, from the beginning, it focused its objectives in the study of antioxidants and cell signalling by Reactive Oxygen and Nitrogen Species (ROS and RNS) in plants of agronomic interest. Without refusing to basic research, the group's activity is also aimed at applied research to ease the knowledge transfer to the production system. After highly contributing to the knowledge advance, the group has gained expertise to potentially exploit it in the Biotechnology and Agro-food fields. The specific objectives are: 1. Study of the physiology of fruits of agricultural interest. The ripening and post-harvest is basically investigated in pepper, tomato and olive, through the analysis of enzymatic and non-enzymatic antioxidants. Likewise, the involvement of nitric oxide (NO), ROS and RNS in those physiological processes is also accomplished. The influence of these molecules in the quality parameters of the selected produces is

analyzed as well. To address this objective, whole fruits, but also subcellular fractions, mainly peroxisomes, are used, and transcriptomic, proteomic and metabolomic approaches are followed. 2. Role of NO and RNS in germination, development and abiotic stress in higher plants. The biochemical and molecular characterization of the endogenous cell targets (proteins, lipids and nucleic acids) involved in nitration and S-nitrosylation events promoted by RNS is investigated, as well as the analysis of their participation in cell signalling processes during germination and development, and in abiotic stresses (salinity, wounding, high and low temperature, heavy metals such as cadmium, and metalloids like arsenic). Arabidopsis and pea are used as model plants, but also pepper, tomato, wheat, rice and olive, and the use of bio-markers induced in those plants in response to the above stress conditions is investigated. These approaches will contribute to the development of strategies and tools for biotechnological applications which allow modifying the regulation of the germination and developmental processes, as well as the selection of plants more tolerant to several environmental stresses. 3. Search for natural bioactive compounds coming from vegetable with nutritional and biotechnological applications. Due to the group's evolution, this objective is addressed to the nutritional and biotechnological sectors. New bioactive compounds (capsaicin, proteins and/or peptides, flavonoids, etc.) and antioxidants from tomato, olive and pepper with beneficial effects for the health, applied through either biomedical therapies or as dermatological products, are investigated. Likewise, in connection with the productive sector, our group carries out the characterization and selection of vegetable varieties especially rich in antioxidants, focused at improving their competitiveness in the markets. The objectives of the group are framed within the VIDA global area, although they do not match with any of the already existing CSIC platforms. We esteem that, according to our profile, shared by a number of CSIC groups, a new PTI specific for FRUITS AS HEALTH SOURCE could be issued. Regarding the open science initiative, we understand that the CSIC should be participant, but without charging it to the financing capacity of groups. The highest amount of pecuniary resources is presumed to come from national and regional grants, where the group's members have already applied. The group would improve its activity by recruiting: - 1 staff scientist - 1 post-doc - 1 pre-doc - 1 technician, level 3

ANTIOXIDANTES, RADICALES LIBRES Y ÓXIDO NÍTRICO EN BIOTECNOLOGÍA Y AGROALIMENTACIÓN (ARNOBA)

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ANTIOXIDANTES, RADICALES LIBRES Y ÓXIDO NÍTRICO EN BIOTECNOLOGÍA Y AGROALIMENTACIÓN (ARNOBA)

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Objetivos

Desde su inicio en 1983, el grupo orientó sus objetivos al estudio de los antioxidantes y la señalización celular por especies de oxígeno y nitrógeno reactivo (ROS y RNS) en plantas de interés agronómico. Sin renunciar al desarrollo de investigación básica, la actividad del grupo está comprometida también con una investigación aplicada en pos de una transferencia de conocimiento hacia el tejido productivo. Tras un

periodo fecundo de generación de conocimiento, hemos acumulado un cuerpo de doctrina con potencial explotable en los campos de la biotecnología y la agroalimentación. Los objetivos específicos son: 1. Estudio de la fisiología de frutos de interés agrícola. Se investiga fundamentalmente la maduración y post-cosecha de frutos de pimiento, tomate y olivo, mediante el análisis de antioxidantes enzimáticos y no enzimáticos. Igualmente se determina la participación del óxido nítrico (NO), ROS y RNS en dicho procesos. Se estudia, asimismo, la influencia de estas moléculas en los parámetros de calidad de los productos. Para abordar este objetivo se emplean frutos completos o bien preparaciones de fracciones subcelulares, principalmente peroxisomas, y se siguen abordajes transcriptómicos, proteómicos y metabolómicos. 2. Función del NO y RNS en la germinación, desarrollo y estrés abiótico en plantas superiores. Se lleva a cabo la caracterización bioquímica y molecular de las dianas celulares endógenas (proteínas, lípidos y ácidos nucleicos) implicadas en los procesos de nitración y S-nitrosilación propiciados por RNS y el análisis de su participación en procesos de señalización celular durante la germinación y el desarrollo, y en estreses abióticos (salinidad, daño mecánico, baja/alta temperatura, metales pesados como el Cd, y metaloides como el As). Se emplean plantas modelo como Arabidopsis y guisante, pero también pimiento, tomate, trigo, arroz y olivo, y se investiga el uso de bio-marcadores inducidos en dichas plantas en respuesta a las condiciones de estrés mencionadas. Estos abordajes contribuirán al desarrollo de estrategias y herramientas de aplicación biotecnológica que permitan regular los procesos de germinación y desarrollo, así como la obtención de plantas más tolerantes frente a distintos estreses abióticos. 3. Prospección de compuestos bioactivos naturales procedentes de productos hortofrutícolas con aplicaciones nutricionales y biotecnológicas. Dada la evolución del grupo, este objetivo se orienta a los sectores alimentario y biotecnológico. Se investigan nuevos componentes bioactivos (capsaicina, proteínas y/o péptidos, flavonoides, etc.) y antioxidantes de tomate, aceituna y pimiento con efectos beneficiosos para la salud, aplicados bien a través de terapias biomédicas o de dermofarmacia. Asimismo, en conexión con el sector productivo, nuestro grupo lleva a cabo la caracterización y selección de variedades de productos hortofrutícolas especialmente ricas en antioxidantes, con vistas a mejorar su competitividad en los mercados. Estos objetivos se engloban en el área global de VIDA, si bien no se encuadran en ninguna de las plataformas ya existentes. Consideramos que, por el perfil del grupo, compartido por un buen número de grupos del CSIC, se podría iniciar una nueva PTI basada en los FRUTOS COMO FUENTE DE SALUD. Con respecto a la iniciativa de ciencia en abierto, entendemos que el CSIC debería de ser partícipe de la misma, sin que ello repercuta en la financiación de los grupos de investigación. Se estima que la mayor parte de los recursos pecuniarios provendrán de proyectos nacionales o autonómicos, a cuyas convocatorias ya han concurrido los miembros del grupo. El grupo sustanciaría su actividad con la incorporación de: - 1 científico (plantilla) - 1 post-doc - 1 pre-doc - 1 técnico, grupo 3

This group started in 1983 and, from the beginning, it focused its objectives in the study of antioxidants and cell signalling by Reactive Oxygen and Nitrogen Species (ROS and RNS) in plants of agronomic interest. Without refusing to basic research, the group's activity is also aimed at applied research to ease the knowledge transfer to the production system. After highly contributing to the knowledge advance, the group has gained expertise to potentially exploit it in the Biotechnology and Agro-food fields. The specific objectives are: 1. Study of the physiology of fruits of agricultural interest. The ripening and post-harvest is basically investigated in pepper, tomato and olive, through the analysis of enzymatic and non-enzymatic antioxidants. Likewise, the involvement of nitric oxide (NO), ROS and RNS in those physiological processes is also accomplished. The influence of these molecules in the quality parameters of the selected produces is analyzed as well. To address this objective, whole fruits, but also subcellular fractions, mainly peroxisomes, are used, and transcriptomic, proteomic and metabolomic approaches are followed. 2. Role of NO and RNS in germination, development and abiotic stress in higher plants. The biochemical and molecular characterization of the endogenous cell targets (proteins, lipids and nucleic acids) involved in nitration and S-nitrosylation events promoted by RNS is investigated, as well as the analysis of their participation in cell signalling processes during germination and development, and in abiotic stresses (salinity, wounding, high and low temperature, heavy metals such as cadmium, and metalloids like arsenic). Arabidopsis and pea are used as model plants, but also pepper, tomato, wheat, rice and olive, and the use of bio-markers induced in those plants in response to the above stress conditions is investigated. These approaches will contribute to the development of strategies and tools for biotechnological applications which allow modifying the regulation of the germination and developmental processes, as well as the selection of plants more tolerant to several environmental stresses. 3. Search for natural bioactive compounds coming from vegetable with nutritional and biotechnological applications. Due to the group's evolution, this objective is addressed to the nutritional and biotechnological sectors. New bioactive compounds (capsaicin, proteins and/or peptides, flavonoids, etc.) and antioxidants from tomato, olive and pepper with beneficial effects for the health, applied through either biomedical therapies or as dermatological products, are investigated. Likewise, in connection with the productive sector, our group carries out the characterization and selection of vegetable varieties especially rich in antioxidants, focused at improving their competitiveness in the markets. The objectives of the group are framed within the VIDA global area, although they do not match with any of the already existing CSIC platforms. We esteem that, according to our profile, shared by a number of CSIC groups, a new PTI specific for FRUITS AS HEALTH SOURCE could be issued. Regarding the open science initiative, we understand that the CSIC should be participant, but without charging it to the financing capacity of groups. The highest

amount of pecuniary resources is presumed to come from national and regional grants, where the group's members have already applied. The group would improve its activity by recruiting: - 1 staff scientist - 1 post-doc - 1 pre-doc - 1 technician, level 3

BIODISPONIBILIDAD DE MINERALES

Especialización

A7. Ciencias y Tecnologías de Alimentos

A7.1 Alimentos funcionales y Nutrición

LS - LIFE SCIENCES

LS4 Physiology, Pathophysiology and Endocrinology

7. Other

7.1. Other

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.2. Sustainable and competitive agri-food sector for a safe and healthy diet

Investigadores Principales

(Información no disponible)

Objetivos

Contribuir al conocimiento básico orientado de la digestibilidad y metabolismo mineralo-proteico en dependencia de factores propios del individuo y de su dieta, tratando de profundizar en la relación dieta-salud. Actualmente se plantea: - Estudiar la influencia y mecanismos de acción de compuestos originados en la Reacción de Maillard (PRMs) sobre la biodisponibilidad de nutrientes, estrés oxidativo, metabolismo y funcionalidad de hueso, etc. - Contribuir al conocimiento de la absorción de PRMs y de sus posibles efectos metabólicos en prevención de enfermedades degenerativas óseas que afectan a hombres y animales.

The main objective of this research line is contribution to the knowledge of the digestibility and metabolism of minerals and protein, in relation to specific factors from the individual and those from the diet, trying to deepen the diet-health relationship. Currently, there are the following partial objectives: - To study the effects and mechanism of action of compounds originating from the heating reactions (the Maillard reaction products, PRMs) on nutrient bioavailability, oxidative stress, metabolism and functionality of bone, etc.. - To contribute to the knowledge of the absorption of PRMs and their metabolic effects in preventing bone degenerative diseases affecting humans and animals

BIOFERTILIZACIÓN Y BIORREMEDIACIÓN POR HONGOS RIZOSFÉRICOS

Especialización

A4. Ciencias Agrarias

A4.3 Interacciones plantas/organismos/medioambiente

LS - LIFE SCIENCES

LS9 Applied Life Sciences and Non-Medical Biotechnology

7. Other

7.1. Other

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.1. Sustainable agriculture and forestry

Investigadores Principales

GARCIA GARRIDO, JOSE MANUEL

Objetivos

1.- Estudio de la Interacción sinérgica entre hongos saprobios y hongos endófitos de raíz. 2.- Regulación molecular de la simbiosis micorriza arbuscular: Papel de fitohormonas en el proceso de regulación de la micorrización. Caracterización y análisis funcional de genes reguladores del proceso de micorrización. 3.- Empleo de microorganismos en la mejora del cultivo de plantas de interés agrícola e industrial en suelos degradados o contaminados. 4.- Empleo de hongos saprobios para la biorremediación de alpeorujos y su uso como fertilizante orgánico. Contribución de los hongos micorrízicos en el efecto fertilizante del alpeorujos transformado por hongos saprobios. Empleo del alpeorujos transformado por hongos saprobios en fertilización, descontaminación, biocontrol y conservación de la biodiversidad del suelo. Empleo de hongos saprobios y arbusculares en la valorización de otros residuos agrícolas e industriales. 5. Biorremediación de suelos contaminados con PAHs mediante consorcios entre plantas micorrizadas, nuevas cepas fúngicas capaces de oxidar PAHs y bacterias productoras de biosurfactantes. Estudio de los mecanismos de actuación de la simbiosis micorriza arbuscular frente a la degradación de PAHs. 6.- Diseño, formulación y mejora de biofertilizantes de base micorriza en combinación con otros microorganismos promotores del crecimiento vegetal: Efectos de distintas formulaciones sobre diversas plantas de interés agrícola, forestal y medioambiental. Estudio de las interacciones de cepas de potencial interés en inoculantes micorrízicos con otros microorganismos promotores del crecimiento vegetal. 7.-Establecimiento de protocolos estándar para la cuantificación y certificación de la presencia de micorrizas en sistemas de producción de plantas a escala industrial. 8.- Estudio de los exudados de interés biológico (hormonas, aminoácidos, etc.) producidos por inoculantes micorrízicos in Vitro: posibles aplicaciones en la industria agropecuaria, viverística,

medioambiental, farmacéutica y cosmética. El éxito en el logro de estos objetivos estará sujeto a las siguientes amenazas: a) Serias dificultades para contar con jóvenes investigadores e investigadores postdoctorales. b) La política de financiación de la investigación científica es inestable y no bien definida, y c) La falta de apoyo en la financiación científica por parte de la industria y entidades privadas Otros aspectos: a- recursos CLAVE 2019-21: Sería clave para el buen desarrollo del grupo la incorporación de un investigador con una posición estable, así como la consolidación de los dos puestos de trabajo del personal contratado que desarrollan su actividad en el grupo de manera continuada durante los últimos años. b.- Posicionamiento en las tres áreas globales: Nuestro grupo se posiciona dentro del área global de VIDA, si bien parte de la investigación que realizamos atañe a aspectos de revalorización y gestión de recursos naturales con cierto impacto e influencia en la economía local (SOCIEDAD). c- Interés del grupo por la participación o propuesta de las nuevas Plataformas Temáticas Interdisciplinares (PTI): El programa PTI nos parece una buena iniciativa que debería promocionarse y reforzarse con más financiación propia. Actualmente no participamos en ninguna de las plataformas temáticas interdisciplinares lanzadas, pero sí que estaríamos interesados directamente en una plataforma relacionada con la gestión del suelo y agricultura. d.-Posicionamiento y/o colaboración en iniciativas de ciencia en abierto: Hemos realizado aportaciones a DIGITAL.CSIC y tenemos también publicaciones en revistas de acceso abierto, algunas de ellas con financiación CSIC a través de la Unidad de Recursos de Información para la Investigación (URICI).

1. To study synergistic interaction between endophyte fungi and saprobe fungi in the rhizosphere. 2. Molecular regulation of Arbuscular Mycorrhizal (AM) symbiosis: Role of plant hormones in the regulation of the process of mycorrhization. Characterization and functional analysis of regulatory and marker genes associated to AM symbiosis. 3. Use of microorganisms to improve the growth of plant with agronomic and industrial interest in degraded or polluted soils. 4. Bioremediation of olive dry residue by saprobe fungi and use of this transformed residue as organic amendment. Effect of the mycorrhizal fungi in the fertilizing effect of olive dry residue transformed by saprobe fungi. Use of the bioremediated olive dry residue by saprobe fungi for fertilization, decontamination, biocontrol and soil biodiversity conservation. Valorization of other agricultural and industrial waste by saprobe and arbuscular fungi. 5. Bioremediation of soils contaminated with PAHs by the consortium between mycorrhizal plants, new fungal strains capable of oxidizing PAHs and biosurfactant producing bacteria. Mechanisms of action of the arbuscular mycorrhizal symbiosis against degradation of PAHs. 6. Design, development and improvement of biofertilizers inocula based on Arbuscular Mycorrhiza fungi in combination with other plant growth promoting microorganisms: Effect of different formulations of these biofertilizers inocula on various plants of agricultural, forestry and environmental interest. Study of the interactions between AM fungal strains with potential interest as inoculants and other plant growth promoting microorganisms. 7. Establishment of standard protocols and methodologies to quantify and certify the presence of mycorrhizae in the plant production systems on an industrial scale. 8. Study of biological interest exudates (hormones, amino acids, etc..) from Mycorrhizal inoculants produced "in vitro": potential applications in the agricultural, nursery, environmental, pharmaceuticals and cosmetic industries. Success in achieving these objectives is subject to clearly identified threats, such as: a) Great difficulties to get young and postdoctoral researchers due to little expectation and opportunity to develop their work in the future. b) Unstable and non-well-defined scientific policy of funding investigation; and c) Lack of industrial support and private funding for research. Other aspects a. key resources: Join up a researcher with a stable position able to promote the group's research activity with new ideas and initiatives. Consolidation of the two employment contracts that have been exercised continuously in the group during the last years. b. Area positioning: Our group is clearly positioned within the global area of LIFE although the research we do on bioremediation and recovery of agricultural waste could have impact on the local economy (SOCIETY area). c. PTI participation: The PTI program seems to be a good initiative that should be promoted and reinforced with more self-financing. Currently we do not participate in any of the interdisciplinary thematic platforms launched, but we would be directly interested in a platform related to soil management and agriculture. d. Open access initiatives: We have made contributions to DIGITAL.CSIC and we also have published in open access journals, for which recently we have obtained a subvention from the CSIC Open Access Publication Support Initiative through its Unit of Information Resources for Research (URICI).

BIOLOGÍA REPRODUCTIVA Y MICROSCOPIA AVANZADA DE PLANTAS

Especialización

A4. Ciencias Agrarias

A4.2 Biología, bioquímica y fisiología vegetal

LS - LIFE SCIENCES

LS1 Molecular and Structural Biology and Biochemistry

4. Biotechnology

4.2. Biotechnology-based industrial processes

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.2. Sustainable and competitive agri-food sector for a safe and healthy diet

Investigadores Principales

ALCHE RAMIREZ, JUAN DE DIOS

Objetivos

1) Identificar y caracterizar funcionalmente los productos génicos implicados en el desarrollo del polen y el pistilo, la receptividad estigmática, germinación del polen, e interacciones polen-pistilo. Estudiar las bases celulares y moleculares de la autoincompatibilidad y de los mecanismos de señalización implicados en la orientación del tubo polínico para optimizar la polinización, la fertilización, la calidad y la productividad en especies de interés. 2) Estudiar los efectos de los factores ambientales adversos sobre la eficacia reproductiva y la producción en el olivo y otras especies. 3) Determinar la variabilidad genética y funcional de las proteínas alergénicas. Establecer las implicaciones del polimorfismo en la fisiología reproductiva y en la evaluación clínica y personalización de los tratamientos a pacientes alérgicos. 4) Caracterizar a nivel bioquímico y molecular las formas proteicas y lipídicas mayoritarias presentes tanto en los tejidos de la semilla como en distintos aceites de interés económico como el olivo, así como en los subproductos de su elaboración. Determinar su digestibilidad, alergenicidad y absorción intestinal, explorando usos adicionales que generen valor añadido, especialmente en el ámbito nutracéutico. **OBJETIVOS ESPECÍFICOS** - Caracterizar el papel de las especies de oxígeno reactivo (ROS), del óxido nítrico (NO) y de los enzimas implicados en su metabolismo en la biología reproductiva de plantas con interés agronómico y con diferentes tipos de autoincompatibilidad. - Identificar y caracterizar proteínas del polen y el pistilo implicadas en mecanismos de reconocimiento, analizando su función en el contexto de la incompatibilidad. - Estudiar la función de los lípidos del polen y de los enzimas relacionados con el metabolismo lipídico en la reproducción sexual del olivo y otras especies vegetales oleaginosas. - Estudiar los efectos de la temperatura sobre el desarrollo del polen y su viabilidad y capacidad para germinar, y sobre el desarrollo y el número de óvulos/sacos embrionarios y su viabilidad en distintos cultivares de olivo. - Buscar marcadores moleculares relacionados con el estrés por temperatura en los tejidos reproductivos del olivo mediante herramientas de transcriptómica y proteómica. Papel de las heat shock proteins en la eficiencia reproductiva. - Analizar el polimorfismo molecular y la expresión génica diferencial de las proteínas alergénicas del polen en cultivares de olivo y otras especies de interés alergogénico. - Determinar las implicaciones del polimorfismo alérgico en cuanto al diagnóstico y tratamiento de la alergia. - Definir histológicamente las semillas del olivo y otras especies de interés, y caracterizar a nivel bioquímico y molecular las formas proteicas mayoritarias - Caracterizar las formas proteicas presentes en aceites virgen y refinados, y en los subproductos de su elaboración. - Ensayar la digestibilidad, alergenicidad y absorción intestinal de estas proteínas, y explorar usos adicionales (especialmente nutracéuticos) de los subproductos. **EL CUMPLIMIENTO DE ESTOS OBJETIVOS REQUIERE ADJUDICACIÓN DE RECURSOS CLAVE EN EL PA 2019/21** consistentes en al menos la incorporación de un científico titular, un titulado superior especializado a tiempo completo y personal predoctoral, así como la consideración de recursos de infraestructura de equipamientos, especialmente de adquisición de imagen (ej. CLSM) al grupo o al instituto. - El grupo está claramente posicionado en el área global VIDA. - El grupo, dada su multidisciplinariedad y temática transversal está muy interesado en participar en nuevas PT Interdisciplinares. - La actividad del grupo está posicionada y posee un nivel muy alto de actividad en iniciativas de ciencia en abierto.

1) Identify, characterize and perform functional analyses of the gene products involved in pollen and pistil development, establishment of stigmatic receptivity, pollen germination, and pollen-pistil interactions. Study the cell and molecular basis of self-incompatibility and the signaling mechanisms involved in pollen tube guidance, to optimize pollination, fertilization, quality and productivity of plant species. 2) Study the effects of adverse environmental factors on both reproductive efficiency and yield in plants of interest 3) Determine genetic and functional variability of allergenic proteins. Establish the implications of polymorphism in plant reproductive physiology and in the clinical assessment and personalization of treatments for allergic patients. 4) Characterize at the biochemical and molecular levels the major forms of proteins and lipids present in the seed tissues and oils from plants of economical interest like the olive tree, as well as in by-products generated during their elaboration. Determine their digestibility, allergenicity and intestinal absorption, exploring additional uses able to generate added value, particularly in a nutraceutical scenes. **SPECIFIC OBJECTIVES** - Characterize the role of Reactive Oxygen Species, nitric oxide and the enzymes involved in their metabolism in the reproductive biology of plants with agronomical interest and different types of self-incompatibility. - Identify and characterize pollen and pistil proteins involved in recognition mechanisms in the olive tree and other plant model species, analyzing their function in the frame of the different self-incompatibility models already described. - Study the function of pollen lipids and their related enzymes in the sexual reproduction of the olive tree and other oleaginous plants. - Study the effects of temperature upon pollen development and its viability and ability to germinate, and on the development and number of ovules/embryo sacs and their viability in different olive cultivars. - Search for molecular markers involved in temperature stress in the olive reproductive tissues by means of transcriptomic and proteomic tools. Role of heat shock proteins in reproductive efficiency. - Analyze molecular polymorphism and gene expression of allergenic proteins in pollen from different olive cultivars and other species of allergogenic interest. - Characterize at the functional level the polymorphism and differential gene expression of relevant allergens in reproductive organs. - Determine the implications of allergen polymorphism in allergy diagnosis and treatment - Define histologically the seeds from the olive tree and other plant species of interest. - Characterize at the biochemical and molecular levels the major protein forms. - Characterize the protein forms present in virgin and refined olive oils, and in the subproducts of its elaboration. - Assay digestibility, allergenicity and intestinal absorption of these proteins, and explore additional uses for these subproductos

(particularly nutraceutical). FULFILMENT OF THE OBJECTIVES DESCRIBED ABOVE REQUIRES THE ASSIGNMENT OF KEY RESOURCES THROUGHOUT ACTUATION PLAN 2019/21 consisting at least in the incorporation of a tenured scientist, a full-time specialized graduated technician and Ph.D. students, as well as the consideration of resources for image acquisition (e.g. CLSM) to the research group or institute. - The research group is clearly positioned at the global area LIFE. - As per its multidisciplinary and transversal character, the group is deeply interested in participate at new interdisciplinary platforms. - The activity of the group is clearly positioned and maintains a high activity in open science initiative.

ESTRUCTURA, DINÁMICA Y FUNCIÓN DE GENOMAS DE RIZOBACTERIAS (Ecología Genética de la Rizosfera)

Especialización

A4. Ciencias Agrarias

A4.3 Interacciones plantas/organismos/medioambiente

LS - LIFE SCIENCES

LS2 Genetics, Genomics, Bioinformatics and Systems Biology

4. Biotechnology

4.1. Boosting cutting-edge biotechnologies as future innovation drivers

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.4. Sustainable and competitive bio-based industries

Investigadores Principales

TORO GARCIA, NICOLAS

Objetivos

Objetivos específicos de las líneas de investigación del grupo son: 1) Explorar la diversidad genética y funcional de las bacterias que establecen interacciones de interés biotecnológico con plantas mediante la caracterización del genoma común (genoma "core") y el genoma accesorio del simbiote de alfalfa *Sinorhizobium meliloti* y de los metagenomas de suelos y rizosferas de ecosistemas diversos. 2) Caracterización del conjunto de elementos genéticos móviles (moviloma) de *S. meliloti* como una de las fuentes de plasticidad genómica en estas bacterias. 3) Caracterización y explotación biotecnológica de la diversidad y mecanismos de movilidad de los intrones bacterianos del grupo II. 4) Estudio de la estructura y función de la fracción no codificante (RNoma) de los genomas de cepas diversas de *S. meliloti* y caracterización de los mecanismos de regulación post-transcripcional mediados por RNAs no codificantes en esta bacteria simbiótica. La amenaza para el grupo, y por ello el mayor problema para conseguir alcanzar nuestros objetivos es la actual inestabilidad del sistema de I+D+i en España que lleva a la falta de recursos económicos y humanos, la pérdida de personal cualificado y el desinterés de los estudiantes graduados por seguir la carrera científica. Asimismo, los actuales problemas económicos del CSIC dificultan el progreso de nuestra investigación. El grupo de investigación tiene en este momento tres puestos de Titulado Superior (G1), uno indefinido por sentencia y dos contratados repetidamente dentro de proyectos cuya consolidación y estabilización es requerida dentro del PE 2021. Así mismo cuenta con dos puestos de personal Técnico, uno indefinido por sentencia (G3) y otro contratado repetidamente dentro de proyectos (G2) que necesita consolidación y estabilización dentro de este PE 2021. El grupo tiene interés en participar en plataformas que se puedan desarrollar en distintos ámbitos relacionados con nuestras líneas de investigación: p.e Microbioma de Plantas, Regulación de la Expresión Génica y Biotecnología

Specific objectives of current research lines are: 1) Exploring the functional and genetic diversity of biotechnologically relevant bacteria that establish beneficial interactions with plants through the characterization of the pan genome (i.e. core and accessory genome) of the alfalfa symbiont *Sinorhizobium meliloti* and of soil and rhizosphere metagenomes from a diversity of ecosystems. 2) Characterization of the *S. meliloti* mobilome (i.e. set of mobile genetic elements) as a major source of genomic plasticity in these group of soil bacteria. 3) Characterization and biotechnological exploitation of the diversity of *S. meliloti* group II introns and their mobility mechanisms. 4) Study of the structure and function of the noncoding RNomes of diverse *S. meliloti* strains and deciphering of the mechanism involved in the sRNA-mediated post-transcriptional control of gene expression in this symbiotic bacterium. The threat to the group, hence the major problem to achieve these objectives, is the current instability of the Scientific Research Policy in Spain that involves lack of economical and human resources, loss of high qualified personnel, and disinterest by graduate's students to pursue the scientific career. Likewise, the current economical problems of the CSIC is hampering the progress of our research. The research group has at this moment three hired qualified positions (G1), one indefinite by sentence and two hired within projects repeatedly whose consolidation and stabilization are required within PE 2021. Likewise, the group has two Technical positions hired, one indefinite by sentence (G3) and another (G2) hired within projects repeatedly whose consolidation and stabilization is required within PE2021. The group has interest to participate in Platforms to be organized around our research lines: Plant Microbiome, Gene Expression Regulation and Biotechnology

GENÉTICA DE INFECCIONES FITOBACTERIANAS

Especialización

A4. Ciencias Agrarias

A4.3 Interacciones plantas/organismos/medioambiente
LS - LIFE SCIENCES
LS9 Applied Life Sciences and Non-Medical Biotechnology

4. Biotechnology

- 4.1. Boosting cutting-edge biotechnologies as future innovation drivers
2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.
2.1. Sustainable agriculture and forestry

Investigadores Principales

SOTO MISFFUT, M.JOSE

Objetivos

El objetivo general del grupo se centra en descifrar las bases moleculares que subyacen en el establecimiento de las interacciones planta-bacteria. Especialmente nos interesa identificar señales químicas y nuevos componentes bacterianos que afectan los procesos de colonización y posterior invasión de las plantas. Para ello, empleamos como estrategia la investigación de fenómenos bacterianos asociados a superficie utilizando fundamentalmente la bacteria modelo *Sinorhizobium meliloti*. Algunos de nuestros objetivos específicos son: 1.- Caracterización del volatilo de *S. meliloti* y estudio de sus efectos en bacterias, crecimiento vegetal e interacciones planta-bacteria. 2.- Dilucidar el mecanismo de acción por el que el volátil 2-tridecanona interfiere negativamente en el establecimiento de interacciones planta-bacteria. 3.- Identificar nuevos determinantes genéticos y mecanismos reguladores que gobiernan los distintos tipos de motilidad en superficie mostrados por *S. meliloti*, e investigar su función en la interacción con la planta. a) El grupo de investigación es pequeño (1 investigador de plantilla y 1 técnico compartido con el Servicio de Instrumentación Científica de la EEZ). Por tanto, la incorporación de personal científico estable, investigador de plantilla y/o postdoctoral con contrato de larga duración, es clave para el alcance de los objetivos marcados en el PA 2019-2021. La incorporación de al menos un investigador con experiencia en defensa vegetal complementaría los conocimientos y experiencia del equipo. b) La línea de investigación del grupo se posiciona en el área global de CIENCIAS DE LA VIDA; BCT/Biociencias y Biotecnología, BTC/Biotecnología. c) El grupo estaría interesado en participar en aquella/s Plataforma/s Temática/s Interdisciplinar/es en las que se plantee la búsqueda de soluciones biotecnológicas en el campo de los fitosanitarios, biofertilizantes y/o bioestimulantes dirigidos al control de enfermedades en plantas y al aumento de la productividad de los cultivos para el desarrollo de una agricultura sostenible. d) El grupo está dispuesto a colaborar en las iniciativas de ciencia en abierto.

The main objective of the group is to decipher the molecular bases that govern the establishment of plant-bacteria interactions. We are especially interested in identifying chemical signals and new bacterial components which play a role in plant colonization and invasion. To achieve this goal, we investigate bacterial surface-associated behaviors using mainly the model bacterium *Sinorhizobium meliloti*. Some of our specific objectives are: 1.- Characterization of the *S. meliloti* volatilo and investigation of their effects on bacterial behaviors, plant growth and plant-bacteria interactions. 2.- To elucidate the mechanism of action by which 2-tridecanone interferes negatively in the establishment of plant-bacteria interactions. 3.- Identification of genes and regulatory mechanisms involved in the different types of surface motility exhibited by *S. meliloti*, as well as to investigate their roles in the establishment of associations with plants. a) The research group is small (1 researcher and 1 technician shared with the Scientific Instrumentation Service of the EEZ). Therefore, the incorporation of stable scientific staff, a staff researcher and/or a postdoc with a long-term contract, is crucial in order to achieve the objectives set out in the PA 2019-2021. The incorporation of at least one researcher with experience in plant defense would complement the knowledge and experience in the team. b) The group's research line is positioned in the global area of LIFE SCIENCE; BCT / Biosciences and Biotechnology, BTC / Biotechnology. c) The group would be interested in participating in Interdisciplinary Thematic Platforms which consider biotechnological solutions in the field of phytosanitary products, biofertilizers and/or biostimulants aimed at controlling plant diseases and increasing crop productivity for sustainable agriculture. d) The group is willing to collaborate in open science initiatives

GENÉTICA DE INFECCIONES FITOBACTERIANAS

Especialización

A4. Ciencias Agrarias
A4.3 Interacciones plantas/organismos/medioambiente
LS - LIFE SCIENCES
LS9 Applied Life Sciences and Non-Medical Biotechnology

4. Biotechnology

- 4.1. Boosting cutting-edge biotechnologies as future innovation drivers
2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.
2.1. Sustainable agriculture and forestry

Investigadores Principales

SOTO MISFFUT, M.JOSE

Objetivos

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establecimiento de las interacciones planta-bacteria. Especialmente nos interesa identificar señales químicas y nuevos componentes bacterianos que afectan los procesos de colonización y posterior invasión de las plantas. Para ello, empleamos como estrategia la investigación de fenómenos bacterianos asociados a superficie utilizando fundamentalmente la bacteria modelo *Sinorhizobium meliloti*. Algunos de nuestros objetivos específicos son: 1.- Caracterización del volatilo de *S. meliloti* y estudio de sus efectos en bacterias, crecimiento vegetal e interacciones planta-bacteria. 2.- Dilucidar el mecanismo de acción por el que el volátil 2-tridecanona interfiere negativamente en el establecimiento de interacciones planta-bacteria. 3.- Identificar nuevos determinantes genéticos y mecanismos reguladores que gobiernan los distintos tipos de motilidad en superficie mostrados por *S. meliloti*, e investigar su función en la interacción con la planta. a) El grupo de investigación es pequeño (1 investigador de plantilla y 1 técnico compartido con el Servicio de Instrumentación Científica de la EEZ). Por tanto, la incorporación de personal científico estable, investigador de plantilla y/o postdoctoral con contrato de larga duración, es clave para el alcance de los objetivos marcados en el PA 2019-2021. La incorporación de al menos un investigador con experiencia en defensa vegetal complementaría los conocimientos y experiencia del equipo. b) La línea de investigación del grupo se posiciona en el área global de CIENCIAS DE LA VIDA; BCT/Biociencias y Biotecnología, BTC/Biotecnología. c) El grupo estaría interesado en participar en aquella/s Plataforma/s Temática/s Interdisciplinar/es en las que se plantee la búsqueda de soluciones biotecnológicas en el campo de los fitosanitarios, biofertilizantes y/o bioestimulantes dirigidos al control de enfermedades en plantas y al aumento de la productividad de los cultivos para el desarrollo de una agricultura sostenible. d) El grupo está dispuesto a colaborar en las iniciativas de ciencia en abierto.

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GENÉTICA DE INFECCIONES FITOBACTERIANAS

Especialización

A4. Ciencias Agrarias

A4.3 Interacciones plantas/organismos/medioambiente

LS - LIFE SCIENCES

LS9 Applied Life Sciences and Non-Medical Biotechnology

4. Biotechnology

4.1. Boosting cutting-edge biotechnologies as future innovation drivers

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.1. Sustainable agriculture and forestry

Investigadores Principales

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Objetivos

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HOMEOSTASIS IÓNICA Y TRANSPORTADORES DE MEMBRANA

Especialización

A4. Ciencias Agrarias

A4.1 Agrobiotecnología y mejora vegetal

LS - LIFE SCIENCES

LS1 Molecular and Structural Biology and Biochemistry

4. Biotechnology

4.2. Biotechnology-based industrial processes

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.1. Sustainable agriculture and forestry

Investigadores Principales

BELVER CANO, ANDRES JOSE

Objetivos

Investigar, desde un enfoque integrado, los mecanismos bioquímicos y moleculares de la homeostasis iónica en plantas, con el fin de desarrollar aplicaciones biotecnológicas implicadas en la tolerancia salina y en el aumento de la eficiencia en la nutrición mineral y del uso del agua, así como la eficiencia de la fotosíntesis en condiciones de estrés en plantas de interés agronómico. La identificación y la función de los genes que codifican a sistemas de transporte de Na⁺, K⁺, H⁺ y Cl⁻ y sus proteínas reguladoras (NHX, SOS, CHX, CCX, HKT, NhaD y KEA) son objeto de investigación en sistemas modelo heterólogos (*E. coli*, levadura y *Arabidopsis*) y en plantas de interés agronómico (tomate y cítricos). Para lograr este propósito nos servimos del análisis funcional *in vitro* e *in vivo*. Los enfoques *in vitro* conllevan la purificación y la reconstitución de proteínas de membrana en liposomas, para la determinación de su actividad de transporte, mientras que el análisis funcional *in vivo* se basa principalmente en uso de mutantes y en experimentos de sobreexpresión y silenciamiento génico (RNAi, CRISPR/CAS) en *Arabidopsis* y tomate. Así mismo, diseccionamos factores genéticos relacionados con el control de la homeostasis iónica implicados en la tolerancia a la salinidad en tomate y cítricos, mediante la identificación de genes que codifican a transportadores de iones implicados en QTLs de gran efecto sobre la halotolerancia en términos de producción de fruta, combinando el mapeo de QTLs, análisis de genes candidatos y genética reversa (RNAi, CRISPR/CAS). a. Estimación de recursos clave El principal problema viene derivado de las dificultades actuales de financiación del CSIC y los recortes presupuestarios de I+D por parte del MINECO, que han supuesto un retraso en la apertura y resolución de la convocatoria de proyectos, así como en algunos casos el incumplimiento de los plazos para aportar la dotación presupuestaria de proyectos concedidos de fondos regionales. Todo ello ha repercutido en los recursos humanos del grupo y las posibilidades de mantener el personal formado debido a la paralización de contratación en el CSIC. Esta situación se agrava debido a la escasez de oferta programas de formación de doctores, la supresión de los programas JAE del CSIC, que ha impedido dar continuidad a investigadores posdoctorales que han formado parte de nuestro grupo, así

como la escasez de técnicos de laboratorio (en nuestro grupo, un técnico para tres investigadores de plantilla). Por tanto, estimamos como recursos clave para el grupo en los planes de acción 2019 a 2021, la incorporación de al menos un técnico de laboratorio, y de un investigador posdoctoral. b. Posicionamiento en las tres áreas globales Nuestro posicionamiento como grupo investigador se encuadra dentro del área global de la Vida y en menor medida en Sociedad-Vida. c. Interés del grupo por la participación o propuesta de las nuevas Plataformas Temáticas Interdisciplinarias. Nuestro grupo estaría interesado en participar por afinidad temática en la PTI de Suelo y Agricultura, o en cualquiera otra iniciativa que surja en relación al Reto 2 del H2020, Bioeconomía: Sostenibilidad de los Sistemas de Producción Primaria y Forestales, Seguridad y Calidad Alimentaria, Investigación Marina y Marítima y Bioproductos, particularmente en lo que se refiere a la mitigación y adaptación de cultivos al cambio climático d. Posicionamiento y/o colaboración en iniciativas de ciencia en abierto Estaríamos interesados en el caso de que hubiera suficiente financiación para ello.

We use an integrated approach to study the biochemical and molecular mechanisms of ion homeostasis in plants in order to develop biotechnological applications to improve salt tolerance, mineral nutrition and water use efficiency as well as photosynthesis efficiency in abiotic stress conditions in crop plants. The identification and function of Na⁺, K⁺ Cl⁻ and H⁺ transport systems and their regulatory proteins (NHX, SOS, CHX, CCX, HKT, NhaD and KEA) are investigated in model systems (yeast and Arabidopsis) and crop plants (tomato and citrus). For this purpose we use in vitro and in planta functional analysis. In vitro approaches imply membrane protein purification and reconstitution in liposomes, whereas in planta analysis is mainly based on gene overexpression and silencing (RNAi, CRISPR/CAS) experiments (Arabidopsis tomato). In addition, we dissect genetic factors related to the control of ion homeostasis involved in salt tolerance of tomato and citrus by identification of ion transporter-encoding genes involved in QTLs of great effect on halotolerance in terms of production of fruit, combining QTL mapping, candidate gene analysis and reverse genetic (RNAi, CRISPR/CAS) . a. Estimation of key resources. The main difficulties arise from budget limitations imposed in both CSIC and R&D funds from the competent Ministry (MCIU), all due to the last economic crisis. This has caused and is still causing delays in the opening and resolution of research funding calls. Additionally, research funds of already approved proposals have not been released on time. Budget cuts have had important consequences on human resources of our research group making it impossible to retain highly qualified personnel, or hire replacements . The situation has become even more critical due to the withdrawal of several fellowship programmes (FPU, JAE) and shortage in programmes like Juan de la Cierva and Ramón y Cajal, as well as the shortage of technical personnel in the group (currently a technician is available for three staff researchers). Therefore, we estimate the incorporation of at least one laboratory technician and one postdoctoral researcher as key resources for the group in the 2019-2021 action plans. b. Positioning in the three global areas Our positioning as a research group falls within the global area of Life and to a lesser extent in Society-Life. c. Interest of the group for the participation or proposal of the new Interdisciplinary Thematic Platforms. Our group would be interested in participating by topic affinity in the PTI of Land and Agriculture, or in any other initiative that arises in relation to Challenge 2 of H2020, Bioeconomy: Sustainability of Primary and Forest Production Systems, Food Safety and Quality, Research Marine and Maritime and Bioproducts, particularly in regard to mitigation and adaptation of crops to climate change d. Positioning and / or collaboration in open science initiatives We would be interested in the case that there would have sufficient financing for it.

HOMEOSTASIS IÓNICA Y TRANSPORTADORES DE MEMBRANA

Especialización

A4. Ciencias Agrarias

A4.1 Agrobiotecnología y mejora vegetal

LS - LIFE SCIENCES

LS1 Molecular and Structural Biology and Biochemistry

4. Biotechnology

4.2. Biotechnology-based industrial processes

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.1. Sustainable agriculture and forestry

Investigadores Principales

BELVER CANO, ANDRES JOSE

Objetivos

Investigar, desde un enfoque integrado, los mecanismos bioquímicos y moleculares de la homeostasis iónica en plantas, con el fin de desarrollar aplicaciones biotecnológicas implicadas en la tolerancia salina y en el aumento de la eficiencia en la nutrición mineral y del uso del agua, así como la eficiencia de la fotosíntesis en condiciones de estrés en plantas de interés agronómico. La identificación y la función de los genes que codifican a sistemas de transporte de Na⁺, K⁺, H⁺ y Cl⁻ y sus proteínas reguladoras (NHX, SOS, CHX, CCX, HKT, NhaD y KEA) son objeto de investigación en sistemas modelo heterólogos (E.coli, levadura y Arabidopsis) y en plantas de interés agronómico (tomate y cítricos). Para lograr este propósito nos servimos del análisis funcional in vitro e in vivo. Los enfoques in vitro conllevan la purificación y la reconstitución de proteínas de membrana en liposomas, para la determinación de su actividad de transporte, mientras que el análisis funcional in vivo se basa principalmente en uso de mutantes y en experimentos de

sobreexpresión y silenciamiento génico (RNAi, CRISPR/CAS) en Arabidopsis y tomate. Así mismo, diseccionamos factores genéticos relacionados con el control de la homeostasis iónica implicados en la tolerancia a la salinidad en tomate y cítricos, mediante la identificación de genes que codifican a transportadores de iones implicados en QTLs de gran efecto sobre la halotolerancia en términos de producción de fruta, combinando el mapeo de QTLs, análisis de genes candidatos y genética inversa (RNAi, CRISPR/CAS).

a. Estimación de recursos clave El principal problema viene derivado de las dificultades actuales de financiación del CSIC y los recortes presupuestarios de I+D por parte del MINECO, que han supuesto un retraso en la apertura y resolución de la convocatoria de proyectos, así como en algunos casos el incumplimiento de los plazos para aportar la dotación presupuestaria de proyectos concedidos de fondos regionales. Todo ello ha repercutido en los recursos humanos del grupo y las posibilidades de mantener el personal formado debido a la paralización de contratación en el CSIC. Esta situación se agrava debido a la escasez de oferta programas de formación de doctores, la supresión de los programas JAE del CSIC, que ha impedido dar continuidad a investigadores posdoctorales que han formado parte de nuestro grupo, así como la escasez de técnicos de laboratorio (en nuestro grupo, un técnico para tres investigadores de plantilla). Por tanto, estimamos como recursos clave para el grupo en los planes de acción 2019 a 2021, la incorporación de al menos un técnico de laboratorio, y de un investigador posdoctoral.

b. Posicionamiento en las tres áreas globales Nuestro posicionamiento como grupo investigador se encuadra dentro del área global de la Vida y en menor medida en Sociedad-Vida.

c. Interés del grupo por la participación o propuesta de las nuevas Plataformas Temáticas Interdisciplinares. Nuestro grupo estaría interesado en participar por afinidad temática en la PTI de Suelo y Agricultura, o en cualquiera otra iniciativa que surja en relación al Reto 2 del H2020, Bioeconomía: Sostenibilidad de los Sistemas de Producción Primaria y Forestales, Seguridad y Calidad Alimentaria, Investigación Marina y Marítima y Bioproductos, particularmente en lo que se refiere a la mitigación y adaptación de cultivos al cambio climático.

d. Posicionamiento y/o colaboración en iniciativas de ciencia en abierto Estaríamos interesados en el caso de que hubiera suficiente financiación para ello.

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c. Interest of the group for the participation or proposal of the new Interdisciplinary Thematic Platforms. Our group would be interested in participating by topic affinity in the PTI of Land and Agriculture, or in any other initiative that arises in relation to Challenge 2 of H2020, Bioeconomy: Sustainability of Primary and Forest Production Systems, Food Safety and Quality, Research Marine and Maritime and Bioproducts, particularly in regard to mitigation and adaptation of crops to climate change.

d. Positioning and / or collaboration in open science initiatives We would be interested in the case that there would have sufficient financing for it.

INTERACCIONES PLANTA-BACTERIA

Especialización

A4. Ciencias Agrarias

A4.3 Interacciones plantas/organismos/medioambiente

LS - LIFE SCIENCES

LS9 Applied Life Sciences and Non-Medical Biotechnology

4. Biotechnology

4.2. Biotechnology-based industrial processes

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.1. Sustainable agriculture and forestry

Investigadores Principales

SANJUAN PINILLA, JUAN

Objetivos

El objetivo general de este grupo es adquirir conocimientos básicos sobre los mecanismos moleculares de las interacciones planta-bacteria y bacteria-bacteria, y explorar sus aplicaciones biotecnológicas. Específicamente se aborda: 1.-Identificación y caracterización de componentes moleculares y respuestas bacterianas y vegetales importantes durante el establecimiento de asociaciones planta-microbio de tipo mutualista y patogénico. 2.-Señalización molecular a través de c-di-GMP en interacciones planta-bacteria mutualistas y patogénicas 3.-Regulación post-transcripcional mediada por sRNAs en bacterias patogénicas 4.- Identificación y caracterización de nuevos biopolímeros y otras biomoléculas, con aplicaciones biotecnológicas y utilidad en agricultura sostenible y medioambiente. a.- Estimación de recursos clave: - Personal: - 1 Científico titular. - 4 jóvenes investigadores (pre- y postdoctorales) - Equipamiento: - 1 lector de placa multimodal b.- Posicionamiento en áreas globales: VIDA, MATERIA c.- Interés en PTIs: SoilBio; SustPlast; Xylella d.- Posicionamiento y/o colaboración en iniciativas de ciencia en abierto: - Publicamos en revistas open access - Mantenemos actualizado el repositorio Digital.CSIC - Participamos como editores de revistas en abierto (ej. Frontiers in Microbiology)

The broad goal of this group is to acquire new knowledge on the molecular mechanisms governing diverse plant-bacteria and bacteria-bacteria interactions, and their biotechnological applications. Specific objectives are: 1.- Identification and characterization of molecular components and plant and bacterial responses during the establishment of mutualistic and pathogenic plant-bacterial associations. 2.- c-di-GMP molecular signaling in mutualistic and pathogenic plant-bacteria interactions. 3.- Characterization of novel biopolymers and other biomolecules, with biotechnological applications, useful for sustainable agricultura and environment.

METABOLISMO DEL NITRÓGENO

Especialización

A4. Ciencias Agrarias

A4.3 Interacciones plantas/organismos/medioambiente

LS - LIFE SCIENCES

LS8 Evolutionary, Population and Environmental Biology

4. Biotechnology

4.3. Innovative and competitive platform technologies

2. Food security, sustainable agricultura, marine and maritime research and the bioeconomy.

2.1. Sustainable agricultura and forestry

Investigadores Principales

BEDMAR GOMEZ, EULOGIO JOSE

Objetivos

Obtener conocimientos sobre la desnitrificación en endosimbiontes de leguminosas utilizando *Bradyrhizobium diazoefficiens* como modelo para estudiar el proceso tanto en vida libre como en simbiosis. Para ello, se contempla el estudio integrado de los factores ambientales, genes y enzimas y procesos de óxido-reducción que intervienen en la desnitrificación, prestando especial interés a la identificación de los reguladores transcripcionales que controlan su expresión y actividad y a la caracterización del mecanismo molecular de dichos reguladores. En la interacción planta-bacteria-medio ambiente, el Grupo trata de establecer la interrelación fijación de N₂-desnitrificación, y conocer los factores ambientales y mecanismos de regulación implicados en la reducción de la emisión del gas invernadero óxido nitroso por bacterias endosimbióticas de leguminosas, así como el análisis de la biodiversidad de tales bacterias. Mediante estudios de metagenómica se pretende analizar la abundancia relativa, la diversidad funcional, y la actividad de las poblaciones de bacterias desnitrificantes en muestras medioambientales, fundamentalmente aguas y sedimentos contaminados con nitratos, así como analizar su distribución espacial y temporal. Finalmente, el Grupo está interesado en el estudio de los mecanismos del microsimbionte con potencial para incrementar la tolerancia de la simbiosis bacteria-leguminosa a estreses abióticos y mejorar su eficiencia como bioinoculantes. La consecución de estos objetivos está supeditada a los presupuestos futuros que, a corto y medio plazo, las distintas Instituciones, regionales, nacionales e internacionales, dediquen a la política científica incluyendo la investigación, el desarrollo y la innovación y, especialmente, los recursos humanos. Dadas las bajas de personal ocurridas en el Grupo en los últimos años, para alcanzar los objetivos propuestos, es necesaria la incorporación al Grupo, al menos, de dos doctores y un personal técnico de apoyo a la investigación. Respecto a su posicionamiento dentro de las tres áreas globales, el grupo se adscribe a las áreas de VIDA y SOCIEDAD y su interacción (S-V). En cuanto a la participación del Grupo en las posibles Plataformas Temáticas Interdisciplinares, nuestro interés se centra en las relacionadas con Alimentación y Salud, Suelos y Agricultura y Cambio Climático. El grupo considera que la publicación de sus resultados en Ciencia Abierta es clave para su internacionalización y visibilidad, por lo que participará de forma activa en la publicación en revistas Open Access, así como en la revisión de artículos e intervención en comités editoriales de la mismas.

Improve knowledge on denitrification in endosymbionts of legumes using *Bradyrhizobium diazoefficiens* as a model to study this process both in free-living and symbiotic conditions. To achieve this goal, an integrated study of environmental factors, genes and enzymes involved in denitrification, with special focus on the identification of regulators and their molecular mechanism will be pursued. In the interaction plant-bacteria-environment, the group attempts to establish the interrelation between N₂-fixation and denitrification, and to reveal the environmental factors and regulatory mechanisms underlying the greenhouse gas nitrous oxide emission by the endosymbiotic bacteria, as well as the analysis of their biodiversity. Another goal of our research deals with metagenomics approaches to analyze the relative abundance, functional diversity, and activity of the denitrifying bacterial populations in environmental samples, mainly waters and sediments contaminated with nitrates. Finally, the Group is interested in the study of the mechanisms of the microsymbionts aimed to increase the tolerance of the legume-bacteria symbiosis and to improve their efficiency as bioinoculants. The achievement of these objectives is subjected to the availability of future budgets that, in a short and medium term, the regional, national and international institutions allocate to the scientific policy, research, development and innovation, especially human resources

MICORRIZAS

Especialización

A4. Ciencias Agrarias

A4.3 Interacciones plantas/organismos/medioambiente

LS - LIFE SCIENCES

LS9 Applied Life Sciences and Non-Medical Biotechnology

4. Biotechnology

4.1. Boosting cutting-edge biotechnologies as future innovation drivers

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.1. Sustainable agriculture and forestry

Investigadores Principales

AZCON GONZALEZ DE AGUILAR, CONCEPCION

Objetivos

Objetivos generales Desarrollo de investigación fundamental y estratégica en relación con la ecología, fisiología, bioquímica, biología molecular y biotecnología de las micorrizas arbusculares (MA), y/o los hongos MA, que permita avanzar en su conocimiento y facilitar su aplicación en agricultura y medio ambiente. Objetivos específicos Objetivo operacional # 1. Analizar la diversidad de hongos MA en ecosistemas naturales. Establecimiento y mantenimiento de colecciones de hongos MA. Objetivo operacional # 2. Establecer las bases moleculares de la nutrición de plantas micorrizadas y de su tolerancia al exceso de metales. Objetivo operacional # 3. Establecer las bases fisiológicas y moleculares de la tolerancia a estreses osmóticos (salinidad y sequía) de las plantas micorrizadas. Objetivo operacional # 4. Procesos de señalización y reconocimiento en micorrizas arbusculares. Mecanismos de inducción de resistencia frente a patógenos y plagas por los hongos MA. Objetivo operacional # 5. Mecanismos de interacción de los hongos MA con otros microorganismos rizosféricos. Objetivo operacional # 6. Promover desarrollos biotecnológicos que faciliten la aplicación de los hongos MA y otros microorganismo rizosféricos en agricultura, restauración de ecosistemas Mediterráneos degradados y recuperación de flora amenazada. Estimación de recursos CLAVE requeridos en los planes de acción 2019 a 2021: Dos plazas de Científico Titular que complementen los objetivos operacionales #1 (Analizar la diversidad de hongos MA en ecosistemas naturales...) y # 3 (Establecer las bases fisiológicas y moleculares de la tolerancia a estreses osmóticos ...). Dos plazas de Técnico de laboratorio G3 para completar la proporción de un técnico por investigador en plantilla. Dos plazas de Titulado Superior G1 expertos en Bioinformática y Estadística respectivamente. Posicionamiento en las tres áreas globales : VIDA y en cierta medida en la interacción V-S Interés del grupo por la participación o propuesta de las nuevas Plataformas Temáticas Interdisciplinares: El grupo podría participar en Plataformas Interdisciplinares relacionadas, como puedan ser las de SUELO y BIODIVERSIDAD. En cualquier caso, la información de la que disponemos es fragmentaria lo que ha implicado que, de momento, no estamos implicados en ninguna de ellas. Posicionamiento y/o colaboración en iniciativas de ciencia en abierto: Aunque los integrantes del grupo han publicado algunos de sus resultados en revistas en abierto, consideramos que, en ocasiones, estas revistas responden mas a intereses económicos que científicos.

To promote basic and strategic research related to the ecology, physiology, biochemistry, molecular biology and biotechnology of arbuscular mycorrhizas (AM) and/or AM fungi, allowing their rational application to improve agricultural sustainability and environmental quality. 1. To analyse the diversity of AM fungi in target agricultural systems and natural ecosystems, and implementation of AM fungal collections (germplasm bank). 2. To gain information on the molecular basis of nutrient exchange and metal homeostasis in mycorrhizal plants. 3. To gain information on the physiological and molecular basis of the tolerance of mycorrhizal plants to abiotic stresses (salinity, drought and extreme temperatures). 4. Signalling processes in arbuscular mycorrhizas. Mechanisms underlying the induction of plant resistance to pathogens and pests by

- AM fungi. 5. Mechanisms underlying the interactions among AM fungi and other rhizosphere microorganisms.
6. Biotechnology and application of AM fungi and other rhizosphere microorganisms in agriculture and for the recovery of mediterranean degraded ecosystems, and endangered and/or endemic flora.

MICROBIOLOGÍA AMBIENTAL Y BIODEGRADACIÓN (sustituye a Degradación de Tóxicos Orgánicos)

Especialización

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2.4. Sustainable and competitive bio-based industries

Investigadores Principales

MARQUES MARTIN, SILVIA

Objetivos

1. Entender el metabolismo bacteriano y las relaciones entre Reinos en la rizosfera: descifrar los mecanismos moleculares implicados en la persistencia y adaptación de bacterias en vida libre y en biofilms asociadas al sistema radicular de plantas, utilizando *Pseudomonas* como sistema modelo. Queremos entender el papel de determinantes de superficie (EPS, adhesinas, etc.) en los estilos de vida planctónico y sésil, y profundizar en el papel de señales ambientales e intracelulares (ej., c-di-GMP) en la transición entre estos estilos de vida en bacterias beneficiosas y fitopatógenas. 2. En *Pseudomonas aeruginosa* y el patógeno de plantas *Pectobacterium atrosepticum* analizamos las interacciones patógeno-huésped, especialmente aquellas necesarias para la infección, con el objetivo final de encontrar nuevos compuestos antimicrobianos que actúen a ese nivel. Estudiamos los mecanismos de percepción de las señales ambientales y del huésped (rutas quimiosensoras, sistemas reguladores, y sistemas de señalización de superficie celular (cell-surface signalling)). Las aplicaciones biotecnológicas requieren conocer las señales que definen las distintas características de la fisiología bacteriana y cómo estas interaccionan con sus proteínas sensoras. 3. El trabajo en biodegradación se centra en distintos hidrocarburos aromáticos, nitroaromáticos, cloroaromáticos, pesticidas y contaminantes emergentes, para caracterizar molecularmente nuevas rutas de degradación aerobias y anaerobias, incluyendo la construcción de cepas mejoradas mediante ingeniería metabólica y el análisis molecular de enzimas y reguladores. Integrando las líneas 1 y 3, estudiamos las interacciones planta-bacteria para optimizar las estrategias de biorremediación. 4. Estudiamos la diversidad bacteriana de sitios contaminados y prístinos, investigando la respuesta de la microbiota a los cambios en su entorno. Estudiamos su diversidad funcional para identificar bacterias y genes implicados en biodegradación en el medio ambiente, explorando su uso como fuente de nuevas actividades con relevancia biotecnológica. La utilización biotecnológica del conocimiento generado aporta los consiguientes beneficios para la sociedad: bacterias promotoras del crecimiento, control de patógenos, eliminación de contaminantes, fitorremediación, síntesis de compuestos de valor añadido, etc. Se han generado varias patentes y se ha creado una empresa de base biotecnológica (Biolliberis). El grupo participa habitualmente en programas de formación de doctores (Plan Estatal, CSIC, UGR), y en actividades de divulgación. - La actividad del grupo en 2014-2017 demuestra las necesidades CLAVE de personal laboral: para desarrollar los proyectos financiados, se han contratado en este periodo el equivalente a 6 titulados superiores y un técnico a tiempo completo por 3 o más años. El carácter estructural de estas necesidades se refleja en que actualmente se mantiene el nivel de contratación del grupo (un equivalente de 6 contratos a febrero de 2019). Estas necesidades se ven incrementadas con la incorporación de 3 científicos de plantilla y la jubilación de una auxiliar de laboratorio, generando necesidades adicionales de personal. El grupo ha formado a investigadores que podrían optar a plazas de científico titular, sin opción de retenerlos por la escasez actual de recursos. - La actividad del grupo se encuadra en el área global VIDA, con consecuencias directas e interacciones en el área SOCIEDAD (sostenibilidad de los ecosistemas), y lateralmente con MATERIA (nanomateriales). - Varios investigadores del grupo son integrantes activos de las plataformas PT15-SOILBIO y PT16-XYLELLA. - El grupo, especialmente algunos componentes, participa habitualmente en actividades de divulgación y cultura científica.

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MICROBIOLOGÍA AMBIENTAL Y BIODEGRADACIÓN (sustituye a Degradación de Tóxicos Orgánicos)

Especialización

A4. Ciencias Agrarias

A4.3 Interacciones plantas/organismos/medioambiente

LS - LIFE SCIENCES

LS2 Genetics, Genomics, Bioinformatics and Systems Biology

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MICROBIOLOGÍA AMBIENTAL Y BIODEGRADACIÓN (sustituye a Degradación de Tóxicos Orgánicos)

Especialización

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Investigadores Principales

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Objetivos

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A4. Ciencias Agrarias

A4.3 Interacciones plantas/organismos/medioambiente

LS - LIFE SCIENCES

LS2 Genetics, Genomics, Bioinformatics and Systems Biology

4. Biotechnology

4.1. Boosting cutting-edge biotechnologies as future innovation drivers

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.4. Sustainable and competitive bio-based industries

Investigadores Principales

MARQUES MARTIN, SILVIA

Objetivos

1. Entender el metabolismo bacteriano y las relaciones entre Reinos en la rizosfera: descifrar los mecanismos moleculares implicados en la persistencia y adaptación de bacterias en vida libre y en biofilms asociadas al sistema radicular de plantas, utilizando *Pseudomonas* como sistema modelo. Queremos entender el papel de determinantes de superficie (EPS, adhesinas, etc.) en los estilos de vida planctónico y sésil, y profundizar en el papel de señales ambientales e intracelulares (ej., c-di-GMP) en la transición entre estos estilos de vida en bacterias beneficiosas y fitopatógenas. 2. En *Pseudomonas aeruginosa* y el patógeno de plantas *Pectobacterium atrosepticum* analizamos las interacciones patógeno-huésped, especialmente aquellas necesarias para la infección, con el objetivo final de encontrar nuevos compuestos antimicrobianos que actúen a ese nivel. Estudiamos los mecanismos de percepción de las señales ambientales y del huésped (rutas quimiosensoras, sistemas reguladores, y sistemas de señalización de superficie celular (cell-surface signalling)). Las aplicaciones biotecnológicas requieren conocer las señales que definen las distintas características de la fisiología bacteriana y cómo estas interaccionan con sus proteínas sensoras. 3. El trabajo en biodegradación se centra en distintos hidrocarburos aromáticos, nitroaromáticos, cloroaromáticos, pesticidas y contaminantes emergentes, para caracterizar molecularmente nuevas rutas de degradación aerobias y anaerobias, incluyendo la construcción de cepas mejoradas mediante ingeniería metabólica y el análisis molecular de enzimas y reguladores. Integrando las líneas 1 y 3, estudiamos las interacciones planta-bacteria para optimizar las estrategias de rizadorremediación. 4. Estudiamos la diversidad bacteriana de sitios contaminados y prístinos, investigando la respuesta de la microbiota a los cambios en su entorno. Estudiamos su diversidad funcional para identificar bacterias y genes implicados en biodegradación en el medio ambiente, explorando su uso como fuente de nuevas actividades con relevancia biotecnológica. La utilización biotecnológica del conocimiento generado aporta los consiguientes beneficios para la sociedad: bacterias promotoras del crecimiento, control de patógenos, eliminación de contaminantes, fitorremediación, síntesis de compuestos de valor añadido, etc. Se han generado varias patentes y se ha creado una empresa de base biotecnológica (Biolliberis). El grupo participa habitualmente en programas de formación de doctores (Plan Estatal, CSIC, UGR), y en actividades de divulgación. - La actividad del grupo en 2014-2017 demuestra las necesidades CLAVE de personal laboral: para desarrollar los proyectos financiados, se han contratado en este periodo el equivalente a 6 titulados superiores y un técnico a tiempo completo por 3 o más años. El carácter estructural de estas necesidades se refleja en que actualmente se mantiene el nivel de contratación del grupo (un equivalente de 6 contratos a febrero de 2019). Estas necesidades se ven incrementadas con la incorporación de 3 científicos de plantilla y la jubilación de una auxiliar de laboratorio, generando necesidades adicionales de personal. El grupo ha formado a investigadores que podrían optar a plazas de científico titular, sin opción de retenerlos por la escasez actual de recursos. - La actividad del grupo se encuadra en el área global VIDA, con consecuencias directas e interacciones en el área SOCIEDAD (sostenibilidad de los ecosistemas), y lateralmente con MATERIA (nanomateriales). - Varios investigadores del grupo son integrantes activos de las plataformas PT15-SOILBIO y PT16-XYLELLA. - El grupo, especialmente algunos componentes, participa habitualmente en actividades de divulgación y cultura científica.

1 Understanding bacterial metabolism and the interactions among species of different kingdoms in the rhizosphere: We aim to decipher the molecular mechanisms responsible for the persistence and adaptation of bacteria, either in their free-living state or in plant root associated biofilms, using species of the genus *Pseudomonas* as models. We aim to unravel the role of surface determinants (EPS, adhesins, etc.) in

planktonic and sessile lifestyles and deepen our understanding of the role environmental and intracellular signals (eg., c-di-GMP) play in mediating the switch between both lifestyles in beneficial and phytopathogenic bacteria. 2 Analysis of host-pathogen interactions of *Pseudomonas aeruginosa* and the plant pathogen *Pectobacterium atrosepticum*: Emphasis is given to those interactions required for infection, with the final objective to identify novel antimicrobial agents. We study different mechanisms that permit the sensing of environmental as well as host-derived signals (chemosensory pathways, regulator and cell-surface signalling systems). Biotechnological applications require knowledge of the signal molecules that are associated with different aspects of bacterial physiology as well as information on how these signals interact with their respective sensor proteins. 3 Research in the field of biodegradation is centred on aromatic hydrocarbons, nitro- and chloro-aromatics, pesticides and emerging contaminants to characterize new routes for aerobic as well as anaerobic degradation. This includes the construction of improved strains using metabolic engineering, as well as a molecular analysis of the enzymes and regulator proteins involved. We also analyse plant-bacteria interactions to improve rhizoremediation techniques. 4 We study bacterial diversity in clean and polluted habitats and explore how the microbiota responds to changes in the environment. We analyse the functional diversity of microbial communities to identify bacteria and genes involved in biodegradation, and explore their use as new sources of activities of biotechnological relevance. The biotechnological use of the generated knowledge provides benefits to society: plant growth promoting bacteria, control of pathogens, elimination of contaminants, phytoremediation, synthesis of added value compounds, etc. Several patents have been deposited and a biotech spin-off company was founded (Bio-Iliberis). The group participates habitually in different programs for the training of PhD students (Governmental Research Plan, CSIC, UGR) and in outreach activities. -The activity of the group in 2014-2017 shows the key needs for laboratory staff: in order to execute financed research projects the equivalent of 6 scientists and a technician have been employed full-time over a span of at least 3 years. The structural character of these necessities is reflected by the fact that at present a similar number of research personnel is under contract (6 contracts until February 2019). These necessities are enhanced by the incorporation of 3 staff scientists into the group and the retirement of a technical assistant, which has created an additional need for laboratory personnel. The group has trained scientists that could opt for permanent staff positions (científico titular), but retaining these scientists is largely hampered by scarceness of funding opportunities. -The activity of the group is within the global area of LIFE, with direct consequences and interactions with the area SOCIETY (sustainability of ecosystems) and is laterally related to the area MATTER (nanomaterials). -Several scientists of the group are active members of the platforms PT15-SOILBIO y PT16-XYLELLA. -The members of the group participate habitually in outreach and scientific cultural activities.

NUTRICIÓN ANIMAL

Especialización

A4. Ciencias Agrarias

A4.4 Producción y sanidad animal

LS - LIFE SCIENCES

LS9 Applied Life Sciences and Non-Medical Biotechnology

7. Other

7.1. Other

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.2. Sustainable and competitive agri-food sector for a safe and healthy diet

Investigadores Principales

NIETO LIÑAN, ROSA MARIA

Objetivos

Actividad del grupo encaminada al estudio de la utilización de los nutrientes y la energía por el organismo animal y a la identificación de procesos y compuestos específicos que intervienen en la respuesta metabólica a la ingestión de alimentos. Estas actividades se llevan a cabo fundamentalmente con razas ganaderas autóctonas, esencialmente porcinas, que presentan una mayor adaptación a las condiciones de producción local y dan lugar a productos de calidad, con identidad regional reconocida y apreciados por el consumidor. De esta forma también se contribuye al mantenimiento y expansión de estas razas locales. Se pretende ajustar de forma precisa los programas de alimentación empleados a las necesidades nutricionales propias de estas razas, persiguiendo con ello que los sistemas de producción sean más eficientes y generen un menor impacto ambiental. Adicionalmente, se estudia el empleo de subproductos locales de origen agroindustrial como ingredientes potenciales para la elaboración de dietas prácticas. Estas propuestas, que esencialmente recoge y amplía la actividad que el grupo viene realizando durante los últimos años, puede enmarcarse plenamente en el programa Food Security, sustainable agriculture, marine and maritime research and the bio-economy, recogidos en Horizonte 2020. Como objetivos específicos podemos señalar:

- ampliar la base de datos sobre necesidades nutricionales de razas porcinas locales de la que actualmente dispone el grupo, con información sobre nuevas razas y variedades porcinas autóctonas, fundamentalmente del tronco Ibérico.
- estudiar los efectos biológicos y los mecanismos de acción de sustancias con actividad biológica, presentes en los alimentos o incorporadas a ellos, fundamentalmente los relacionados con la eficiencia en el uso de nutrientes, y la calidad y propiedades saludables de los productos de origen animal.
- explorar el empleo de subproductos locales de origen agroindustrial como fuente adicional de

aminoácidos y energía en la dietas de porcino. d) valorar el empleo de técnicas innovadoras de manejo (inmunocastración) en la producción, bienestar y fisiología animal y sus efectos en la calidad del producto. e) estudiar el impacto del estrés térmico sobre la fisiología e índices productivos del cerdo Ibérico en crecimiento y el empleo de estrategias nutricionales para mitigarlo. *Estimación de recursos CLAVE requeridos: Incorporación de personal científico al grupo en los próximos años (edad media > 54 años), personal técnico fijo para abordar tareas de experimentación animal y nuevas técnicas de laboratorio. Contar con instalaciones adecuadas de experimentación animal, las actuales son insuficientes para abordar las distintas fases productivas que se pretenden estudiar. *Posicionamiento del grupo en áreas globales: VIDA, V-S *Participación en PTI: Interés potencial en participación en plataformas que incidan en los aspectos anteriormente indicados (producción ganadera sostenible, obtención de productos saludables, producción de calidad, etc.) *Colaboración iniciativas ciencia en abierto: actualmente el grupo colabora activamente con grupos nacionales (de otros OPIS, universidades, etc.) e internacionales, formamos parte de un proyecto de grupo operativo regional, y estamos en contacto con otras organizaciones (OPIS, empresas, asociaciones ganaderas) para establecer un grupo operativo nacional.

The activity of the team is focused on the study of energy and nutrient utilization in the monogastric animal and on the identification of processes and specific compounds involved in the metabolic response to feed intake. Such activity will be carried out on native breeds, particularly on local porcine breeds –known to have a wide genetic variation- which show a high adaptability to local production systems and give rise to high-quality products with a regional identity and highly appreciated at the market. They, however, show comparatively lower productivity than the modern, high yielding, conventional breeds. In this way, a contribution to the preservation and development of the diversity of local breeds will also be achieved. On the other hand, the efficiency of livestock production systems will be optimized by accurately defining the nutritional requirements of these local breeds and by increasing the quality and nutritional value of their products, while decreasing the environmental footprint associated. Whenever possible, local by-products will be involved in practical feeding and production systems. This proposal is fully within the frame of the program Food Security, sustainable agriculture, marine and maritime research and the bio-economy from the Horizon 2020. Specific objectives are: a) to widen our current data base on nutritional requirements of native porcine breeds with additional information on new native strains, mainly linked to the Iberian trunk b) to study the biological effects and mechanism of action of substances with biological activity present in feedstuffs or incorporated to them. Among these, we will pay particular attention to those which may alter the efficiency of nutrient utilization and the quality and healthy properties of animal products c) to explore the use of local by-products as ingredients in practical balanced diets for swine d) to assess the effects of innovative management practices (Immunocastration) on productivity, animal welfare and product quality of local porcine breeds. e) to evaluate the impact of heat stress on physiology and productivity of growing Iberian pigs, as well as the use of nutritional strategies to mitigate its detrimental effects. *Key resources: Incorporation of tenured scientist to the group in the coming years (average age of the team > 54 years). Also technical staff is needed to address animal experiments and implementation of new laboratory techniques. To have adequate facilities for animal experimentation, the current ones are insufficient to address the different productive phases intended to be studied * Group positioning in global areas: VIDA, V-S * Participation in PTI: Potential interest in participation in platforms covering the above-mentioned aspects (sustainable livestock production, obtaining healthy and high-quality products, etc.) *Open science initiatives: currently the group actively collaborates with national (OPIS, universities, etc.) and international groups. We are part of a project of regional operating group, and we are in contact with other organizations (OPIS, companies, livestock associations) to establish a national operating group

PASTOS Y SISTEMAS SILVOPASTORALES MEDITERRÁNEOS

Especialización

A4. Ciencias Agrarias

A4.3 Interacciones plantas/organismos/medioambiente

LS - LIFE SCIENCES

LS8 Evolutionary, Population and Environmental Biology

7. Other

7.1. Other

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.1. Sustainable agriculture and forestry

Investigadores Principales

(Información no disponible)

Objetivos

-- Científicos: Proporcionar conocimientos básicos sobre: i) los elementos florísticos constituyentes de los pastos naturales mediterráneos; ii) los procesos ecológicos y ecofisiológicos que rigen sus relaciones con los herbívoros que los aprovechan iii) métodos de evaluación de su oferta forrajera y receptividad ganadera. -- Transferencia: iv) desarrollar herramientas, experiencias demostrativas, y proporcionar criterios de decisión, trasferibles a la gestión y conservación de los sistemas silvopastorales mediterráneos y espacios naturales protegidos. - Síntesis DAFO y Amenazas a estos objetivos: El presente grupo, liderado por un

único investigador de plantilla (doctor ingeniero de montes), documenta una trayectoria científica de más de 30 años en I+D forestal: una disciplina casi inédita, históricamente, en el CSIC, que en nuestros días muestra su creciente proyección en multitud de aspectos críticos de la conservación del medio y consecuencias del cambio global. Es decir, una trayectoria cuyo sentido se ha visto cada vez más fortalecido por las demandas de nuestra sociedad (gestión de recursos y espacios naturales, control de la desertificación, amenazas de pérdida de diversidad, consecuencias del abandono agrario, usos y cambios de uso del suelo, riesgos de incendios, etc.). Demandas a las que el grupo ha venido respondiendo con relevantes contratos, proyectos, experiencias demostrativas, know how, y tareas de formación. Una de las más recientes transferencias del grupo (Programa RAPCA, Junta de Andalucía) ha recibido el máximo premio nacional de lucha contra incendios (Batefuegos de Oro 2012, modalidad de prevención). Fruto de esta capacidad de transferencia, tal reducido grupo (un científico titular, un técnico especializado superior y una investigadora en situación de "indefinida") se ha mantenido durante los últimos años en los máximos de capacidad de fondos de la EEZ. Redundando en ello, las dos evaluaciones externas recibidas en los dos P.E. anteriores, lo identifican como "un grupo pequeño en una línea estratégica importante", pero "necesitado de consolidación". A pesar de ello, dicha valoración ha sido ambas veces desoída y hoy el resultado es la existencia de un pequeño grupo, necesitado de consolidación, en una línea acreditada con máximos de captación de fondos, a las puertas de su desaparición (la jubilación del I.P ha sido en 2017).

- Scientists: Provide basic knowledge on: i) floristic elements constituents of Mediterranean natural pasture; ii) ecological and ecophysiological processes governing its relations with the herbivores iii) methods of evaluating their livestock forage and carrying capacity - Transfer: iv) develop tools, pilot experiences, and provide decision criteria for the management and conservation of Mediterranean silvopastoral systems and protected natural areas. - Synthesis SWOT and Threats to these objectives: This group, led by only one staff member researcher (doctor in forestry engineer), documents a scientific career of over 30 years in R & D on forestry: a discipline almost unprecedented, historically, in CSIC, which today shows an increasing projection in many critical aspects of environmental conservation and consequences of global change. That is, a path whose meaning has been increasingly strengthened by the demands of our society (management of natural spaces and resources, control of desertification, threats of loss of biodiversity, consequences of agricultural abandonment, changes in land use, fire hazards, etc.). These are claims to which the group has been responding with relevant contracts, projects, pilot experiences, know-how, and training tasks. One of the most recent group transfers (Program RAPCA, Andalusian Government) has received the highest national award on Firefighting (Batefuegos de Oro, 2012, prevention modality). In 2017, Dr. José Luis González Rebollar obtained the "Andalusia Award for Environment 2017" Cintia del Castillo (Convocatoria XXI) to an entire Professional Career. The result of this transfer capability, such a small group (a scientist, an advanced specialized technician, and a researcher who has a permanent contract) has been maintained in recent years in the maximum fundraising of the EEZ. In fact, the two external evaluations received in the two previous Strategic Plans identify it as "a small group in an important strategic line of research" but "in need of consolidation." Nevertheless, this assessment has been both times unheeded and today the result is the existence of a small group, in need of consolidation, in accredited line of research, with maximum fundraising, at the gates of his disappearance (the retirement of the IP was in 2017).

PRODUCCIÓN DE PEQUEÑOS RUMIANTES

Especialización

A4. Ciencias Agrarias

A4.4 Producción y sanidad animal

LS - LIFE SCIENCES

LS9 Applied Life Sciences and Non-Medical Biotechnology

4. Biotechnology

4.3. Innovative and competitive platform technologies

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.2. Sustainable and competitive agri-food sector for a safe and healthy diet

Investigadores Principales

MOLINA ALCAIDE, EDUARDA

Objetivos

La actividad del grupo encaja dentro de algunos pilares de las áreas prioritarias del H2020: "Seguridad Alimentaria, Agricultura y Silvicultura Sostenibles, Investigación Marítima y Bioeconomía", "Cambio climático y sostenibilidad energética", "Crecimiento azul" Objetivos: 1) Evaluación nutricional de alimentos convencionales y no convencionales (subproductos, residuos, algas) como estrategia para reducir el coste de la alimentación de rumiantes, para mejorar la salud del animal y para optimizar la fermentación ruminal. El coste de la dieta representa 70-80% del coste total de la producción. El uso de ingredientes no convencionales podría contribuir a lograr este objetivo. El suministro de dietas que incluyan subproductos, desechos o algas, puede tener valor añadido mejorando la salud y el bienestar animal y la calidad de la carne, la leche y los derivados lácteos y reduciendo la producción de metano, gas de efecto invernadero; 2) Estudio de los efectos y mecanismos de acción de aditivos (extractos vegetales, aceites esenciales, compuestos sintéticos, compuestos secundarios) y probióticos sobre la utilización de nutrientes,

fermentación y microbiota ruminal. Según un informe reciente de la EFSA, el uso de antimicrobianos en animales supera con creces las recomendaciones europeas, especialmente en Italia, España. Desarrollar alternativas para mantener una producción animal sana y rentable es crítico en los próximos años; 3) Estudio del potencial de las tecnologías in vitro para simular la fermentación ruminal y reducir el uso de animales de experimentación; 4) Evaluación de los factores involucrados en la colonización microbiana del rumen en etapas tempranas de la vida del rumiantes y la especificidad microbioma del huésped para desarrollar intervenciones nutricionales que permitan programar el ecosistema microbiano y la eficiencia del animal en la edad adulta. a) Recursos CLAVE: Personal investigador de plantilla, técnicos para laboratorio y animalario e infraestructura (Nave de aislamiento de animales, sala de ordeño, recursos para estandarización sanitaria de animales) b) Área: VIDA; intersección de áreas S-V c) Interés en Plataformas relacionadas con la especialidad del grupo: nutrición, producción animal, cambio climático, estudios de sostenibilidad, salud etc. d) Ciencia en abierto: el grupo participa en varias redes

The activity of the group fits within some pillars of the priority areas of H2020: "Food Security, Sustainable Agriculture and Forestry, Maritime Research and Bioeconomy", "Climate change and energy sustainability", "Blue growth" Objectives: 1) Nutritional evaluation of conventional and non-conventional foods (by-products, wastes, algae) as a strategy to reduce the cost of feeding ruminants, to improve animal health and to optimize ruminal fermentation. The cost of the diet represents 70-80% of the total cost of production. The use of non-conventional ingredients could help to achieve this goal. The supply of diets that include by-products, wastes or algae can have added value by improving animal health and welfare and the quality of meat, milk and dairy products and by reducing the production of methane, a greenhouse gas; 2) Study of the effects and mechanisms of action of additives (plant extracts, essential oils, synthetic compounds, secondary compounds) and probiotics on the utilization of nutrients, fermentation and ruminal microbiota. According to a recent EFSA report, the use of antimicrobials in animals far exceeds European recommendations, especially in Italy and Spain. Developing alternatives to maintain healthy and profitable animal production is critical in the coming years; 3) Study of the potential of in vitro technologies to simulate ruminal fermentation and reduce the use of experimental animals; 4) Evaluation of the factors involved in the microbial colonization of the rumen in early stages of ruminant life and the microbiome specificity of the host to develop nutritional interventions that allow programming the microbial ecosystem and the efficiency of the animal in adulthood. a) KEY Resources: Scientific staff, technicians for laboratory and animal management and infrastructure (animal isolation building, milking parlor, resources for sanitary standardization of animals) b) Area: Vida; intersection of S-V areas c) Interest in Platforms related to the specialty of the group: nutrition, animal production, climate change, sustainability studies, health, etc. d) Open Science: the group participates in various networks

PROTECCIÓN VEGETAL

Especialización

A4. Ciencias Agrarias

A4.3 Interacciones plantas/organismos/medioambiente

LS - LIFE SCIENCES

LS9 Applied Life Sciences and Non-Medical Biotechnology

7. Other

7.1. Other

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.1. Sustainable agriculture and forestry

Investigadores Principales

CAMPOS ARANDA, MERCEDES

Objetivos

1.- Profundizar en el conocimiento de la incidencia de los diferentes manejos agronómicos aplicados en el cultivo del olivo sobre la fauna auxiliar asociadas a las principales plagas. 2.- Evaluar las características biológicas y comportamiento de las principales especies depredadoras y parasitoides para potenciar su actividad beneficiosa 3.- Determinar la utilidad de la artropodofauna como bioindicadora de la sostenibilidad de las prácticas agronómicas aplicadas El principal problema para alcanzar los objetivos es la reducida posibilidad de obtener recursos y personal debido al reducido número de convocatorias de proyectos de investigación y a la no resolución de los ya solicitados.

1.-To deepen in the knowledge about the effect of different olive agronomic managements on the main pests and their associated natural enemies. 2.-To assess the biological and behavioural traits of the main species of predator and parasitoids to promote their beneficial activity. 3.-To establish the usefulness of arthropods as sustainable agricultural management bioindicators.

REGULACIÓN REDOX, SEÑALIZACIÓN POR AZÚCARES Y FENOTIPADO MEDIANTE TÉCNICAS DE IMAGEN PARA DETECCIÓN DEL ESTRÉS VEGETAL

Especialización

A4. Ciencias Agrarias

A4.2 Biología, bioquímica y fisiología vegetal
LS - LIFE SCIENCES
LS1 Molecular and Structural Biology and Biochemistry

7. Other

7.1. Other

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.1. Sustainable agriculture and forestry

Investigadores Principales

SERRATO RECIO, ANTONIO JESUS

Objetivos

A.- La regulación redox es una característica esencial de los cloroplastos en la que las tiorredoxinas (Trxs), proteínas implicadas en el intercambio disulfuro/ditio, juegan un papel fundamental. Las condiciones medioambientales cambiantes, en ocasiones adversas, activan mecanismos redox que afectan al metabolismo del cloroplasto. Por ello, el grupo aborda el estudio de los mecanismos moleculares responsables del mantenimiento de la homeostasis redox y del papel de las Trxs como conectores redox que vinculan el proceso fotosintético con otros procesos cloroplastídicos. B.- En el caso del fenotipado vegetal, éste se dirige a la detección precoz del estrés biótico y abiótico, a escala de laboratorio y en campo, mediante el uso de diversas técnicas no invasivas y sensores de imagen, para desarrollar estrategias de protección de los cultivos en el marco de una agricultura de precisión. Los objetivos definidos para cada campo son: A.1.- Profundizar en el papel fisiológico del flujo cíclico de electrones fotosintético (CEF, acrónimo en inglés) en el mantenimiento de la homeostasis redox del cloroplasto mediante el análisis de marcadores de naturaleza redox como las Trxs y sus proteínas diana. A.2.- Analizar si en plantas afectadas en el CEF se producen reajustes metabólicos que provocarían un incremento en la biosíntesis y acumulación de carbohidratos de reserva; evaluar una posible aplicación biotecnológica en la modulación del CEF en cultivos de interés agronómico. A.3.- Búsqueda de proteínas tilacoidales y de la membrana interna del cloroplasto reguladas por las Trxs cloroplastídicas para ampliar nuestro conocimiento sobre los procesos no estromáticos regulados por Trxs directamente relacionados con la fotosíntesis y el intercambio de metabolitos cloroplasto/citosol. B.1.- Evaluar el impacto de infecciones por patógenos y plagas, así como de otros factores de estrés biótico y abiótico en el metabolismo primario y secundario de la planta, junto con los mecanismos de defensa en los que participa. OB.2.- Aplicación de sensores de imagen y algoritmos provenientes del "big data" para: i) desarrollo de métodos de diagnóstico presintomático de estrés biótico y abiótico; ii) screening de mutantes vegetales resistentes o susceptibles a estrés; iii) screening de patógenos afectados en su nivel de virulencia; y iv) evaluación del estado de desarrollo de las plantas. B.3.- Uso de sensores multispectrales y termales en teledetección (drones) así como en robots para invernaderos y campo para desarrollar estrategias de protección de los cultivos en el marco de una agricultura de precisión. El grupo está posicionado en el área global VIDA y la línea de investigación de fenotipado interacciona, debido a su fuerte componente biofísico, con el área de MATERIA, en trabajo conjunto con investigadores del IAA (CSIC. Granada). Esta última línea está integrada en la propuesta de PTI de Xylella. Los recursos necesarios para abordar el nuevo PE serían un Titulado Superior G1, un Científico Titular y contratados predoctorales.

A.- Redox regulation is an essential characteristic of chloroplasts where thioredoxins (Trxs), proteins involved in the exchange disulfide/dithiol, play a key role. Changing environmental conditions, sometimes challenging, result in a redox unbalance affecting the chloroplast metabolism. The group studies the molecular mechanisms involved in preserving the redox balance and the role of Trxs as redox links between photosynthesis and other chloroplast processes. B.- The plant phenotyping research line is focused in the early detection of biotic and abiotic plant stress at lab and field scale. Different non invasive imaging techniques and optical sensors will be used for precision crop protection strategies. The future objectives for each research line are: A. 1- To deep into the physiological role of the cyclic photosynthetic electron flow (CEF) as a key redox-homeostasis mechanism by the analysis of chloroplast redox markers as the Trxs and their target proteins. A.2. - To analyse in CEF mutant plants whether there are metabolic changes provoking and increase in carbohydrate biosynthesis and accumulation; to evaluate modulation of CEF in crops as a useful biotechnological tool. A.3.- To search chloroplast Trxs targets in the thylakoids and the inner membrane system to improve our current knowledge about non-stromatic processes regulated by Trxs that would be directly related to photosynthesis and metabolites exchange between the chloroplast and the cytosol. B.1.- To evaluate the impact of pathogens, plagues and other factors of biotic and abiotic stress on the primary and secondary metabolism of the plants, as well as on the defence mechanisms in which they participate. B.2.- The application of image sensors and "big data" algorithms to plant phenotyping at several levels: i) development of methods for the presymptomatic detection and characterization of biotic and abiotic stress; ii) screening of plant mutants resistant or susceptible to stress; iii) screening of pathogens affected in their virulence level; and iv) evaluation of the developmental stage of the plants. B.3.- The use of the thermal and multispectral sensors in remote (drones) and proximal sensing (robots in greenhouses and field) for precision crop protection strategies. The group requires for the Strategic Plan 2018/21 the incorporation of a tenured scientist, a graduated technician and Ph.D. students, as well as different set-ups for plant phenotyping. The research group is positioned in the area LIFE. The research line about plant phenotyping

with biophysical approaches interacts with the area MATERIA through collaboration with researchers from IAA (CSIC. Granada). This research line is integrated in the proposal for the Interdisciplinary Platform Xylella.

RELACIONES PLANTA-SUELO

Especialización

A4. Ciencias Agrarias

A4.5 Sistemas de producción, suelos y aguas

LS - LIFE SCIENCES

LS9 Applied Life Sciences and Non-Medical Biotechnology

4. Biotechnology

4.1. Boosting cutting-edge biotechnologies as future innovation drivers

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.1. Sustainable agriculture and forestry

Investigadores Principales

NOGALES VARGAS-MACHUCA, ROGELIO ANTONIO

Objetivos

Los objetivos generales y específicos a desarrollar por el grupo de investigación "Relaciones Planta-Suelo" en el PE 2018-2011 conectan con los propuestos en los PE anteriores, pero a su vez constituyen un avance innovador en la reutilización de residuos orgánicos e inorgánicos, la protección de suelos, aguas y cultivos para el desarrollo de sistemas agrícolas sostenibles. 1. Reciclado y valorización de residuos orgánicos e inorgánicos como insumos agrícolas con valor añadido 1.1. Desarrollar procesos de compostaje, vermicompostaje y compostaje con larvas de mosca de diferentes residuos orgánicos y valorar el potencial fertilizante y bioactivo de los productos obtenidos. 1.2 Producir enmiendas orgánicas líquidas a partir de composts y vermicomposts, evaluando su potencial para degradar contaminantes orgánicos 2. Desarrollo de biotecnologías de bajo coste para la prevención y protección de suelos y aguas frente a la contaminación puntual y difusa inducida por los contaminantes orgánicos 2.1 Desarrollar biotecnologías de bioremediación de bajo coste, para la depuración de aguas y efluentes de irrigación contaminados con plaguicidas y contaminantes emergentes y para favorecer la degradación de esos contaminantes en suelos mediante su aplicación directa y/o a través de consorcios microbianos obtenidos a partir de ellos. 2.2. Utilizar nuevos materiales (biochar e hidrochars) como adsorbentes y fotocatalizadores en tecnologías de biodepuración de suelos, aguas y efluentes. 3. Desarrollo de métodos para la gestión sostenible de agrosistemas y su implicación en la provisión de múltiples servicios ecosistémicos. 3.1 Identificación de prácticas agrícolas para el mantenimiento de múltiples servicios ecosistémicos (secuestro de C, ciclos biogeoquímicos de nutrientes, emisión de GEIs, control de plagas). 3.2 Manejo del microbioma del suelo para la comprensión de las relaciones tritróficas entre plantas, fitófagos y enemigos naturales de plagas. a) Estimación de recursos CLAVE Para la consecución de los objetivos propuestos es imprescindible la necesidad de consolidar el personal científico y técnico formado en años anteriores, el cual, actualmente se encuentra en situación precaria o bien han tenido que abandonar su trabajo en el grupo de investigación. En base a ello se estiman los siguientes recursos clave: 1 Científico Titular del CSIC 1 Investigador distinguido del CSIC 1 Titulado Superior de Actividades Técnicas y Profesionales 1 Técnico Superior de Actividades Técnicas y Profesionales b) Posicionamiento en las tres áreas globales: VIDA c) Interés del grupo por la participación o propuesta de las nuevas Plataformas Temáticas Interdisciplinares: Los integrantes del Grupo Relaciones Planta-Suelo participan en la Plataforma Temática Interdisciplinar PTI5-SOILBIO d) Posicionamiento y/o colaboración en iniciativas de ciencia en abierto El grupo de investigación Relaciones Planta-Suelo realiza colaborará en las iniciativas de ciencia en abierto, a través, entre otras, de la publicación de sus artículos científicos en Open Access y el depósito de ellos en DigitalCSIC

The general and specific objectives of the research group "Plant-Soil" to be developed in the PE 2018-21 connect with those proposed in the previous PE, but, in turn, represent an innovative breakthrough in the reuse of organic and inorganic wastes, the protection of soil, water and crops and the development of sustainable agrosystems. 1. Recycling and reuse of organic and inorganic waste as value-added inputs for agriculture 1.1. To develop composting, vermicomposting and composting with fly larvae processes of different organic wastes and to assess the fertilizing and bioactive potential of the products obtained. 1.2 To produce organic liquid amendments from composts and vermicomposts, evaluating their potential to degrade organic pollutants 2. Development of low-cost biotechnologies for the prevention and protection of soil and water against point and diffuse pollution induced by organic pollutants 2.1 To develop low-cost bioremediation biotechnologies for the purification of water and irrigation effluents contaminated with pesticides and emerging pollutants and to favor the degradation of these pollutants in soils through their direct application and / or through microbial consortia obtained from them. 2.2. To use new materials (biochar and hydrochar) as adsorbents and photocatalysts in biodepuration technologies of soils, waters and effluents. 3. Development of methods for the sustainable management of agrosystems and their implications of the provision of multiple ecosystem services. 3.1 Identification of agricultural practices for the maintenance of multiple ecosystem services (C sequestration, biogeochemical cycles of nutrients, GHG emissions, pest control). 3.2 Management of the soil microbiome for the understanding of the tritrophic relationships between plants, phytophagous and natural enemies of pests. a) Estimation of KEY resources To achieve the

proposed objectives, it is essential to consolidate the scientific and technical personnel trained in previous years, which is currently in unstable jobs or have had to abandon its work in the research group. Based on this, the following key resources are estimated: 1 Tenured Scientist of the CSIC 1 Distinguished researcher of the CSIC 1 Higher Degree in Technical and Professional Activities 1 Senior Technician of Technical and Professional Activities b) Positioning in the three global areas: LIFE c) Interest of the group for the participation or proposal of the new Interdisciplinary Thematic Platforms: The members of the Plant-Soil Relations Group participate in the Interdisciplinary Thematic Platform PTI5-SOILBIO d) Positioning and / or collaboration in open science initiatives The Plant-Soil Relations Research Group will collaborate in open science initiatives, though, among others, the publication of their scientific articles in Open Access and the deposit of them in Digital.CSIC

SALUD GASTROINTESTINAL

Especialización

A4. Ciencias Agrarias

A4.4 Producción y sanidad animal

LS - LIFE SCIENCES

LS9 Applied Life Sciences and Non-Medical Biotechnology

7. Other

7.1. Other

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.2. Sustainable and competitive agri-food sector for a safe and healthy diet

Investigadores Principales

RUBIO SAN MILLAN, LUIS ANGEL

Objetivos

Los objetivos del grupo Salud Gastrointestinal (CSIC641427) pueden incluirse en 2 actividades principales: Actividad 1: se relaciona con el estudio de la utilización digestiva y metabólica de nutrientes por medio de la evaluación de los efectos fisiológicos de fracciones químicas de los alimentos (proteínas, carbohidratos, fibra, etc.). Los objetivos concretos relacionados con esta actividad actualmente son: 1.1. estudiar la utilización nutricional, efectos biológicos y comportamiento digestivo de proteínas alimentarias con especial atención a las de leguminosas (leguminas, vicilinas, inhibidores de proteasas) y particularmente del guisante (*Pisum sativum*); 1.2. caracterización por medio de técnicas moleculares de la microbiota intestinal en animales alimentados con proteínas alimentarias; 1.3. identificar y caracterizar serín proteasas de células intestinales que pudieran ser dianas terapéuticas de los inhibidores Bowman-Birk; 1.4. dilucidar las bases moleculares responsables de las variaciones en su actividad biológica frente a serín proteasas involucradas en procesos cancerígenos en colon. Actividad 2: se centra en el estudio de los mecanismos de acción y efectos biológicos, tanto de carácter nutricional como no-nutricional, de sustancias activas presentes en los alimentos o añadidos a la dieta (pre- y probióticos, agentes antibacterianos, etc.). Una atención particular se presta a los efectos de estas sustancias activas sobre la composición de la microbiota intestinal. Los objetivos relacionados con esta actividad son: 2.1. evaluar la supervivencia digestiva y el efecto prebiótico in vivo (rata, ratón) de oligosacáridos naturales (leche, materias primas), así como su capacidad para modular la microbiota digestiva en el tracto gastrointestinal (ileon, ciego y colon); 2.2. evaluar el efecto de la incorporación de sustancias cativas naturales u obtenidas industrialmente sobre la población de especies tanto patógenas (*Salmonella* spp, *Campylobacter jejuni*, *Clostridium perfringens*) como potencialmente patógenas (*Enterobacteriaceae*, *E. coli*) en broilers; 2.3. estudiar la correlación entre las variaciones en la composición de la microbiota digestiva y determinados parámetros fisiológicos, sanitarios y productivos en broilers. Para la realización de estas actividades y consecución de objetivos, el grupo ha llevado a cabo una estimación de RECURSOS CLAVE (personal y equipamiento) requeridos en los planes de acción 2019 a 2021. 1 Personal: El grupo está compuesto en este momento por 3 investigadores de plantilla y no cuenta con personal de apoyo alguno. Tanto la captación de recursos a través de proyectos oficiales como con empresas y la producción científica del grupo son altas, siendo calificado como "muy bueno" en la última evaluación llevada a cabo por el CSIC. Por tanto, teniendo en cuenta tanto la naturaleza y el volumen de trabajo actualmente en curso como la serie de contrataciones que hemos tenido que realizar en los últimos años para llevar a cabo los diversos proyectos de investigación, consideramos que nuestra necesidad de personal es de 2 G1 y 1 G3. 2 Equipamiento: Para la realización del trabajo actualmente en curso el grupo requeriría la adquisición de un nuevo FPLC para purificación de proteínas (el actualmente en uso es muy antiguo, más de 10 años) y un fermentador de flujo continuo para poder llevar a cabo ensayos in vitro de crecimiento bacteriano intestinal. El grupo se posiciona en el área VIDA y dentro de ella en la intersección S-V. Finalmente, debido a sus objetivos y trayectoria científica, el grupo considera de interés su participación en plataformas del tipo "Evaluación nutricional y funcional de proteínas alimentarias" y "Microbiota intestinal y salud".

The objectives of the Gastrointestinal Health Group (CSIC641427) can be included in 2 main activities: Activity 1: this is related to the study of the digestive and metabolic utilization of nutrients by means of the evaluation of the physiological effects of chemical fractions of foods (proteins, carbohydrates, fiber, etc.). The specific objectives linked to this activity currently are: 1.1. study the nutritional use, biological effects and

digestive behaviour of food proteins with special attention to legumes (legumes, vicilins, protease inhibitors) and particularly pea (*Pisum sativum*); 1.2. characterization by means of molecular techniques of the intestinal microbiota in animals fed with food proteins; 1.3. identify and characterize serine proteases from intestinal cells which could be therapeutic targets of Bowman-Birk inhibitors; 1.4. elucidate the molecular bases responsible for variations in their biological activity against serine proteases involved in carcinogenic processes in the colon. Activity 2: focused on the study of the mechanisms of action and biological effects, both nutritional and non-nutritional, of active substances present in food or added to the diet (pre- and probiotics, antibacterial agents, etc.). Particular attention is paid to the effects of these active substances on the composition of the intestinal microbiota. The objectives related to this activity are: 2.1. evaluate the digestive survival and the prebiotic effect in vivo (rat, mouse) of natural oligosaccharides (milk, raw materials), as well as their capacity to modulate the digestive microbiota in the gastrointestinal tract (ileum, caecum and colon); 2.2. evaluate the effect of the incorporation of active substances (both natural or industrially obtained) on the population of pathogenic (*Salmonella* spp., *Campylobacter jejuni*, *Clostridium perfringens*) and potentially pathogenic (*Enterobacteriaceae*, *E. coli*) species in broilers; 2.3. study the correlation between variations in the composition of the digestive microbiota and certain physiological, health and production parameters in broilers. To carry out these activities and achieve the objectives, the group has carried out an estimation of KEY RESOURCES (personnel and equipment) required in the action plans 2019 to 2021. 1 Staff: The group is composed at present by 3 staff researchers and does not have any support staff. Both the collection of resources from official projects and private companies, and the scientific production of the group can be considered as high, being qualified as "very good" in the last evaluation carried out by the CSIC. Therefore, taking into account both the nature and volume of the work currently under way and the series of contracts of personnel that we have had to carry out in recent years to carry out the various research projects, we consider that our need for personnel is 2 G1 and 1 G3. 2 Equipment: To carry out the work currently underway, the group would require the acquisition of a new FPLC for protein purification (the one currently in use is very old, more than 10 years) and a continuous flow fermenter to carry out in vitro assays on bacterial intestinal growth. The group is positioned in the VIDA area and within it at the intersection S-V. Finally, due to its objectives and scientific trajectory, the group considers of interest its participation in platforms such as "Nutritional and functional evaluation of food proteins" and "Intestinal microbiota and health".

SEÑALIZACIÓN POR ESPECIES DE OXÍGENO Y NITRÓGENO REACTIVO EN SITUACIONES DE ESTRÉS EN PLANTAS

Especialización

A4. Ciencias Agrarias

A4.2 Biología, bioquímica y fisiología vegetal

LS - LIFE SCIENCES

LS1 Molecular and Structural Biology and Biochemistry

7. Other

7.1. Other

2. Food security, sustainable agriculture, marine and maritime research and the bioeconomy.

2.1. Sustainable agriculture and forestry

Investigadores Principales

SANDALIO GONZALEZ, LUISA MARIA

Objetivos

El conocimiento de los mecanismos responsables de la percepción de estímulos externos y la especificidad de la respuesta celular a un determinado tipo de estímulo constituyen dos de los grandes retos de la biología vegetal. Para llevar a cabo este estudio se proponen los siguientes objetivos: 1. Función de ROS y NO en la señalización y respuesta de la planta al estrés, tanto biótico como abiótico. Para abordar este objetivo disponemos de diferentes bases de datos procedentes de estudios transcriptómicos de mutantes de *Arabidopsis* con niveles alterados de ROS y NO, lo que nos ha permitido identificar y caracterizar nuevos genes dependientes de estas moléculas que participan en los procesos de señalización de la planta en respuesta a estrés. Además, estudiamos la función de las modificaciones post-traduccionales, dependientes de ROS y NO (S-nitrosilación, nitración, oxidación) de proteínas que participan en la percepción del estrés y transducción de señales (factores de transcripción y hormonas). También analizaremos el papel de la autofagia en la respuesta de la planta a metales pesados y su regulación por ROS y NO. 2. Dinámica de los peroxisomas y señalización dependiente de estos orgánulos. Para abordar este objetivo disponemos de las líneas de *Arabidopsis* con los distintos orgánulos marcados con moléculas fluorescentes, del software, y la tecnología necesaria para estudiar la interacción entre orgánulos y la regulación de la dinámica de los mismos dependientes de ROS y NO en condiciones fisiológicas y de estrés. Disponemos además de líneas de *Arabidopsis* que expresan biosensores de ROS y cambios redox asociados a peroxisomas y otros orgánulos, para visualizar in vivo cambios redox en respuesta al estrés. Por otro lado, realizamos: a) la identificación de componentes de la red de señalización dependiente del peroxisoma, en respuesta a estrés mediante el análisis de transcriptomas de mutantes con los niveles de ROS peroxisomal alterados; b) la caracterización del interactoma de la proteína peroxisomal PEX11a; y c) la selección de mutantes alterados en factores de transcripción dependientes de ROS peroxisomal. A: Estimación de recursos CLAVE requeridos en los planes de acción 2019 a 2021: Se requiere un Técnico de laboratorio con formación FP

Grado Superior y un Técnico Superior con formación de licenciado o graduado, ya que en el laboratorio no tenemos ningún técnico de apoyo. B: Posicionamiento en las tres áreas globales: Nuestro Grupo se posiciona en el Área de Vida, aunque podría estar en la intersección con Sociedad y Vida C: Participación o propuesta de las nuevas Plataformas Temáticas Interdisciplinares. Estaríamos interesadas en participar en la plataforma de Suelos y Agricultura u otra relacionada con contaminación ambiental, cambio climático y mejora de cultivos D: Posicionamiento y/o colaboración en iniciativas de ciencia en abierto: Si estamos interesadas en participar en este tipo de iniciativas para favorecer la difusión de nuestros resultados

The study of mechanisms involved in the perception of external stimuli and the specificity of cell responses to a particular type of stimulus constitute two major challenges in the field of plant biology. This study aims to achieve the following objectives: 1. Function of ROS and NO in signaling and plant response to biotic and abiotic stress. To carry out these studies, we have different databases obtained from previous transcriptomic studies involving *Arabidopsis* mutants with ROS and NO levels altered, which allowed us to identify and characterize new genes dependent on these molecules participating in signaling transduction in response to stress. In addition, we study the function of ROS and NO-dependent post-translational protein modifications (S-nitrosylation, nitration and oxidation) in the perception and signal transduction (transcription factors and hormones). The role of autophagy in plant response to heavy metals and its regulation by ROS and NO will be also analyzed. 2 Dynamics of peroxisomes and signaling dependent of these organelles. To carry out this objective we dispose of an extensive range of mutants with marked organelles with fluorescent proteins; the software and technology needed to analyse cross-talk between organelles and ROS and NO-dependent dynamic regulation under physiological and patho-physiological conditions. Different mutants expressing ROS bio-sensors are also available in our laboratory to visualize redox changes in response to stress, in vivo. On the other hand, we carry out the: a) identification of signalling components in response to stress, which are peroxisome dependent, by transcriptome analysis of mutants with peroxisomal ROS level altered; b) characterization of peroxisomal protein PEX11a interactome and c) screening of mutants with altered levels of peroxisomal dependent transcription factors.

8. Servicios Científico-Técnicos / Scientific & Technical Support Laboratories

8.1 Listado de Servicios / List of Scientific & Technical Support Units

ASESORAMIENTO EN AREA DE CIENCIAS AGRARIAS

Especialización

A0. Especialidad del Área y Subárea Científica CSIC

A4. Ciencias Agrarias

Disciplina ERC

LS - LIFE SCIENCES

Investigadores Principales

BARON AYALA, MATILDE MARIA

Objetivos

BIBLIOTECA ESTACION EXPERIMENTAL DEL ZAIDIN

Especialización

A0. Especialidad del Área y Subárea Científica CSIC

A4. Ciencias Agrarias

Disciplina ERC

LS - LIFE SCIENCES

Investigadores Principales

RAMIREZ MALO, FELICITAS

Objetivos

La biblioteca de la EEZ en Granada, forma parte de la red de bibliotecas asociada a los distintos Centros e Institutos que componen el Consejo Superior de Investigaciones Científicas (CSIC), el mayor Organismo Estatal de Investigación de España. Aunque los recursos de la biblioteca de la EEZ tienen un marcado carácter multidisciplinar, pertenece al grupo de bibliotecas especializadas en ciencias agrarias. Desde el año 2000 se encuentra ubicada en un edificio nuevo, que incluye una sala de lectura, sala de ordenadores, espacio de trabajo y archivo. El catálogo de los fondos de la biblioteca ha sido digitalizado y es compartido con el resto de bibliotecas de la red CSIC. El catálogo puede visualizarse a través del enlace (http://aleph.csic.es/F?func=file&file_name=find-b). Los fondos bibliográficos del CSIC se remontan a 1950 y actualmente ascienden a más de 6000 monografías y 409 revistas, de las cuales la EEZ está suscrita a 19. La misión principal de la biblioteca es dar apoyo a la investigación que se realiza en la EEZ (<http://www.eez.csic.es/?q=es/node/805>). Entre los servicios que ofrece a los investigadores, se encuentran la Sala de Lectura, acceso a la información online, préstamos bibliotecarios, solicitud de documentos fuera de la EEZ y acceso online desde fuera del Centro (<http://www.eez.csic.es/?q=es/node/104>). Dado su nivel de especialización, la biblioteca de la EEZ podría definirse como una biblioteca pública, con acceso restringido, orientada a estudiantes Universitarios pre- y post graduados, estudiantes de doctorado, investigadores y profesores universitarios. En términos generales, su principal área de especialidad son las ciencias agrarias y afines. Los servicios para usuarios externos son más restringidos: sala de lectura y acceso a la información bibliográfica. El préstamo inter-bibliotecario se basa principalmente en intercambios bibliográficos con otras bibliotecas de la red CSIC y universitarias. Las tareas internas de la biblioteca están relacionadas con procesos técnicos: gestión física y digital de los fondos, catalogación compartida, clasificación de monografías y atención a las peticiones de los usuarios. Desde un punto de vista técnico, la Unidad de Coordinación de Bibliotecas (CBIC) es responsable de la coordinación y desarrollo de las bibliotecas del CSIC, incluyendo la de la EEZ, y se encarga de digitalizar y gestionar el proceso de automatización. A nivel funcional, la biblioteca de la EEZ se encuentra bajo la gestión y administración de la EEZ. Dirección de contacto: Bibzaidin@eez.csic.es and pizaidin@eez.csic.es

The library at Estación Experimental del Zaidin (EEZ), Granada, Spain, is part of the CSIC's library network linked to the different Centres and Institutes that make up Consejo Superior de Investigaciones Científicas (CSIC) the largest state body of research in Spain. Although the resources of EEZ's library have a marked multidisciplinary character, this library belongs to a group of specialized libraries on agricultural sciences. Since 2000 it has been located in a new building comprising a reading room, computer room, working space and archive hall. The catalogue of bibliographic holdings has been computerized and is shared by all libraries within the CSIC network. The catalogue can be screened via the website (http://aleph.csic.es/F?func=file&file_name=find-b). The library collections at EEZ began around 1950 and currently include over 6000 monographs and 409 serials, nineteen of which the EEZ is currently subscribed to. The key mission of the library is to provide support to the research being conducted at EEZ (<http://www.eez.csic.es/?q=es/node/805>). The services provided to the researchers include a reading room, on-line access to information sites, book loans, request of documents not found in the EEZ library, and off-campus online access (<http://www.eez.csic.es/?q=es/node/104>). Because of its level of specialization, the Institute's library could be defined as a restricted public library oriented to graduate University students, PhD students, researchers, and University teaching staff. In general, its major area of specialty is Agriculture and related sciences. The services provided to external users are more limited, i.e. reading room and internet

access to bibliographic information. The inter-library loan service basically deals with bibliographic exchanges with other CSIC network libraries and University libraries. The library's internal tasks are related to technical processes: paper and electronic serials management, cooperative acquisitions, shared cataloguing and monograph classification, user service at the library desk, and replying to internal and external queries. From a technical standpoint, the CSIC Libraries Coordination Unit (known as CBIC in Spanish) is responsible for the coordination and development of the CSIC libraries, including EEZ's library, and is in charge of monitoring and managing the automation process. At a functional level, EEZ's library is under the management and administration of EEZ. Contact addresses: Bibzaidin@eez.csic.es and pizaidin@eez.csic.es. Statistics: <http://www.csic.es/cbic/estadisticas/estadisticas.html>

EVALUACION, RESTAURACION Y PROTECCION DE AGROSISTEMAS MEDITERRANEOS (SERPAM)

Especialización

A0. Especialidad del Área y Subárea Científica CSIC

A4. Ciencias Agrarias

Disciplina ERC

LS - LIFE SCIENCES

Investigadores Principales

ROBLES CRUZ, ANA BELEN

Objetivos

El servicio dispone de dos doctoras en biología (especialistas en botánica) y de un técnico en Recursos naturales y paisajísticos. Además, el servicio cuenta con los siguientes recursos materiales: • Estufa de aire forzado para secado de material vegetal • Frigorífico y cámara fría • Cámara de germinación • Granatarios y balanza de precisión • Material para herbario: prensa, lupa binocular, claves de determinación, material de disección. • GPS • Software estadístico y GIS • Material de campo para la evaluación de la vegetación • Material de campo para la realización de siembras y limpieza de semillas

The service has two doctors in biology (specialists in botany) and a technician in Natural resources and landscape. In addition, the service has the following material resources: • Forced air oven for drying vegetal material • Refrigerator and cold room • Germination chamber • Balances and precision balance • Herbarium material: press, binocular magnifying glass, determination keys, dissection material. • GPS • Statistical and GIS software • Field material for vegetation monitoring • Field material for sowing and seed cleaning

INVERNADEROS Y CÁMARAS DE CULTIVO

Especialización

A0. Especialidad del Área y Subárea Científica CSIC

A4. Ciencias Agrarias

Disciplina ERC

LS - LIFE SCIENCES

Investigadores Principales

BELVER CANO, ANDRES JOSE

Objetivos

La reserva tanto de las cámaras de crecimiento como de los invernaderos se realiza a través de la intranet del centro del que tiene constancia el responsable del servicio. Las reservas se realizan por metros cuadrados. Para reservas externas hay que contactar con el responsable del servicio directamente. Dos personas del servicio de mantenimiento del centro prestan apoyo a las instalaciones controlando diariamente su funcionamiento. Además, una persona al 33% se encarga de la vigilancia y control de plagas en las instalaciones así como en algunos casos del riego de las plantas, a demanda de los usuarios y según la disponibilidad. Prácticamente todos los equipos de refrigeración/calor se han renovado en los últimos dos años, y los que quedan se harán próximamente gracias a fondos de infraestructura concedidos recientemente.

The growth chambers and the greenhouses can be reserved by the EEZ users by using the EEZ intranet. The reservation is made by square meters. The external users should contact the service in charge. There are two technicians from the general management who are in charge of the good working of the installations and check them everyday. Also, there are one person at 33% who is in charge of controlling the pest and in some case of watering the plants. Almost all the refrigeration/hot equipment have been renovated in the last two years. The remaining one are planned to be renovated during 2015.

LABORATORIO DE RADIOQUÍMICA

Especialización

A0. Especialidad del Área y Subárea Científica CSIC

A4. Ciencias Agrarias

Disciplina ERC

LS - LIFE SCIENCES

Investigadores Principales

Objetivos

El Laboratorio de Radioquímica cuenta con dos laboratorios: 1. El primer laboratorio está situado en la Casa Roja de la sede Central de la EEZ en Profesor Albareda 1, en Granada capital. Este laboratorio consta de dos laboratorios adyacentes: Uno monitorizado y otro controlado. Las labores con radioisotopos de baja actividad como electroforesis, secado de geles o autoradiografías se llevan a cabo en la parte monitorizada. Las labores que conllevan marcado y almacenamiento de radioisotopos y residuos radiactivos se llevan a cabo en la parte controlada. El equipamiento consiste en un detector de contaminación radioactiva Geiger-Müller, un contador de centelleo, un termociclador, un horno de hibridación, un congelador, una nevera y un equipo de protección contra la radiación. A su vez consta del equipamiento necesario para marcar ADN, hibridar ADN y ARN, autoradiografías y comprobar la incorporación de radioisotopos en células vegetales y microorganismos. 2. El segundo laboratorio está ubicado en la sede de la EEZ en Armilla (Granada), C/ Camino del Jueves s/n. Este laboratorio sólo cuenta con una estancia habilitada para el uso de todo lo mencionado anteriormente. En particular este laboratorio se usa para detectar mediante radioinmuno ensayo (RIA) hormonas animales con el isótopo 125I. Cuenta a su vez con un detector de radioactividad y material de protección y de deshecho. Ambas instalaciones y sus operarios están sujetas a las leyes españolas siguientes: Real Decreto 1836/1999 (modificado por el RD 35/2008), que aprobó la Regulación de las Instalaciones Nucleares y Radioactivas. Real Decreto 783/2001 que aprobó la Regulación de la protección de la salud contra la radiactividad.

The radiochemistry laboratory has the following facilities: 1. One facility on the first floor of Casa Roja (Red House) at the main EEZ Headquarters at Calle Profesor Albareda,1 in Granada. The facilities at the main site contain two adjacent laboratory spaces: a monitored and a controlled area. Operations that involve the use of very low radioisotope activities, such as electrophoresis, gel drying, autoradiography, etc. are carried out in the monitored area. Operations involving the labelling and storage of radioisotopes and radioactive residues are carried out in the controlled area. The Radiochemistry Laboratory is equipped with Geiger-Müller contamination detectors, a liquid scintillation counter, a thermocycler, a hybridization oven, a freezer, a refrigerator and suitable radiation protection equipment. It also has the necessary equipment for DNA labelling, DNA and RNA hybridization, autoradiography, tests on the incorporation of radioisotopes into plant cells and microorganisms, among others. 2. One laboratory, also owned by EEZ, numbered 116 located in Armilla at the Institute of Animal Nutrition (Calle Camino del Jueves s/n) in Armilla (Granada). The facility at this site is made up of a single laboratory, and although it is suitable for carrying out the aforementioned operations, it is mainly used for determinations of animal hormones by radioimmune assays (RIA) with 125I. It also has the necessary instruments for the detection of radiation, and the required materials for radio protection and storage of residues/waste products. Since this is a radioactive facility, its operations are subjected to the Spanish legislation governing this type of facilities: - Royal Decree 1836/1999 (modified by RD 35/2008), which approved the Regulations on Nuclear and Radioactive Installations. - Royal Decree 783/2001, which approved the Regulations on Health protection against Ionizing

MICROSCOPIA CONFOCAL Y TRANSMISIÓN ELECTRÓNICA

Especialización

A0. Especialidad del Área y Subárea Científica CSIC

A4. Ciencias Agrarias

Disciplina ERC

LS - LIFE SCIENCES

Investigadores Principales

OLMEDILLA ARNAL, ADELA ISABEL

Objetivos

El servicio es demandado por los usuarios a través de la página web del centro y dispone de los siguientes servicios: 1) Estereomicroscopio Epifluorescencia Leica M165FC - Objetivos - Apo 1X/ - Planapo 5X/0.5 19mm - Ópticas/iluminaciones: - Campo claro (luz transmitida, epi-iluminación) - Epifluorescencia (uv, azul, GFP, verde) - Cámara digital de alta resolución 2) Microscopio Invertido de Epifluorescencia Leica DMI600B - Objetivos: - NPLAN 10X/0.25 PH1 -/B 17.6 - NPLAN 20X/0.35 PH1 1.0/C 6.9 - HCX PLAPO 40X/1.25 oil PH3 C5 0.17 - HCX PL FL 100X/1.30 oil PH3 17D - Ópticas: - Campo claro - Contraste de fase - DIC - Epifluorescencia (uv, azul, GFP, verde) - Cámara digital de alta resolución 3) Sistema modular de microscopía de barrido laser confocal Nikon C-1, integrado por las siguientes unidades: -Microscopio invertido Nikon Eclipse TE2000-U. Platina motorizada PROSCAN NIKON TE2000. Campo claro, Nomarski (DIC) y epifluorescencia (lámpara de mercurio, bloques de filtros estándar: azul, verde, ultravioleta). -Objetivo CFI PL APO 4x AN 0,2 WD 15,7 mm -Objetivo CFI PL APO 10x AN 0,45 WD 4,0 mm -Objetivo CFI PL FLUOR 20x AN 0,75 WD 0,35 mm multi-immersión -Objetivo CFI PL FLUOR 40x AN 1,30 WD 0,2 mm oil -Objetivo CFI PL APO 60x AN 1,4 WD 0,21 mm oil -Objetivo CFI PL APO VC 100x AN 1,40 WD 0,13 mm oil -Módulo confocal, no espectral, detección simultánea de cuatro canales (tres láseres mas canal diascópico de transmisión). "Pinhole" variable motorizado (tres tamaños + abierto). Resolución de escaneo hasta 2048x2048 pixels (12 bits). Motor piezoeléctrico para el eje z. Bancada de láseres (4 láseres + AOTF) Láseres disponibles: -Diodo Azul (36 mW)(405 nm) -Ar (50mW) (457nm, 477nm, 488nm, 514nm) -He-Ne

(2mW) (543nm) -Diodo rojo (10mW) (638nm) 4) Sistema de Microscopía Electrónica de Transmisión JEOL JEM-1011, integrado por las siguientes unidades: -JEM-1011 TEM, 100 kV, pieza polar EM-SAP10B, 0.4 nm resolución puntual. Tres modos de aumento. Portamuestras para dos especímenes. Tilting. Disponibilidad para fotomicrografía analógica (película). -Sistema de captura digital de imágenes SIS Megaview III para TEM. Sensor CCD 1360x1024 pixels. Software AnalySIS DOCU para captura de imágenes y análisis. 5) Microtomo RM 2165 Leica 6) Ultramicrotomo Reichert-Jung ULTRACUT. 7) Máquina de fabricar cuchillas de vidrio Leica EM KMR3 8) Vibratomo Leica VT1200s 9) Procesador automático de tejidos Leica EM TP 10) Sistema de inclusión de muestras en parafina Leica EG1150

The use of the service can be reserved through the web site of the service and the services are: 1) Leica Epifluorescence Stereomicroscope M165FC - Objectives - Apo 1X/ - Planapo 5X/0.5 19mm - Optics/lighting: - Bright field (transmitted light, epi-lighting) - Epifluorescence (uv, blue, GFP, green) - High resolution digital camera 2) Leica Inverted Epifluorescence Microscope DMI600B - Objectives: - NPLAN 10X/0.25 PH1 -/B 17.6 - NPLAN 20X/0.35 PH1 1.0/C 6.9 - HCX PLAPO 40X/1.25 oil PH3 C5 0.17 - HCX PL FL 100X/1.30 oil PH3 17D - Optics: - Bright Field - Phase contrast - DIC - Epifluorescence (uv, blue, GFP, green) - High Resolution digital camera 3) Nikon C-1 Modular Confocal Laser Scanning Microscope System, integrated by the following units: -Nikon inverted microscope Eclipse TE2000-U. Motor operated stage PROSCAN NIKON TE2000. Brightfield, Nomarski DIC observation and epifluorescence (standard mercury lamp, standard block filters: blue, green, ultraviolet). -Objective CFI PL APO 4x AN 0,2 WD 15,7 mm -Objective CFI PL APO 10x AN 0,45 WD 4,0 mm -Objective CFI PL FLUOR 20x AN 0,75 WD 0,35 mm multi-immersion -Objective CFI PL FLUOR 40x AN 1,30 WD 0,2 mm oil -Objective CFI PL APO 60x AN 1,4 WD 0,21 mm oil -Objective CFI PL APO VC 100x AN 1,40 WD 0,13 mm oil -Confocal module, non-spectral, non-fully motorized, four-channels simultaneous detection (three lasers plus transmission diascopic channel). Variable motorized pinhole (three sizes + open). Scanning resolution up to 2048x2048 pixels (12 bits). Piezo-electric z-axis motor. Laser unit (4 lasers + AOTF) Lasers available: -Blue diode (36 mW) (405 nm) -Ar (50 mW) (457 nm, 477 nm, 488 nm, 514 nm) -He-Ne (2 mW) (543 nm) -Red diode (10 mW) (638 nm) 4) JEOL JEM-1011 Transmission Electron Microscope System, integrated by the following units: -JEM-1011 TEM, 100 kV, polepiece EM-SAP10B, 0.4 nm point resolution. Three magnification modes. Two-specimens holder. Tilting. Analogical (film) photomicrography availability. -SIS Megaview III digital imaging system for TEM. CCD image sensor 1360x1024 pixels. AnalySIS DOCU software for image capture and analysis. 5) Reichert-Jung ULTRACUT ultramicrotome. This device constitutes equipment assigned to one of the research sublines of the institute. The subline grants the CTEM service full access to this apparatus in a shared basis. 6) LKB Glass-knife maker. This device constitutes equipment assigned to one of the research sublines of the institute. The subline grants the CTEM service full access to this apparatus in a shared basis. 7) Leica EM KMR3 Glass-knife maker. 8) Vibratome Leica VT1200s 9) Automated tissue processor Leica EM TP 10) Tissue embedder system for paraffin Leica EG1150

SERVICIO DE ANÁLISIS DE CARBONO Y NITRÓGENO

Especialización

A0. Especialidad del Área y Subárea Científica CSIC

A4. Ciencias Agrarias

Disciplina ERC

LS - LIFE SCIENCES

Investigadores Principales

HUESO IBAÑEZ, RAFAEL

Objetivos

Los usuarios deben mandar sus muestras directamente al servicio junto con el correspondiente formulario relleno, el cual se puede descargar de la página web del servicio.

The users may send the samples directly to the service together with the corresponding form filled, which can be downloaded from the web site of the service.

SERVICIO DE INSTRUMENTACIÓN CIENTÍFICA

Especialización

A0. Especialidad del Área y Subárea Científica CSIC

A4. Ciencias Agrarias

Disciplina ERC

LS - LIFE SCIENCES

Investigadores Principales

KRELL, TINO

Objetivos

El Servicio de Instrumentación está dotado en la actualidad de diversas técnicas híbridas cromatografía/espectrometría de masas (GC-MS, LC-MS) y espectrómetro de emisión óptica de plasma acoplado inductivamente (ICP-óptico), con un gran potencial para el análisis elemental de compuestos en muestras de orígenes muy diversos. Los equipos son: A) Equipos de cromatografía líquida: -HPLC Waters

Allience 2695 Detector de longitud de onda dual acoplado un Micromass Quattro micro API Mass Spectrometer (HPLC/MS) -HPLC Waters modelo 1525 Detector PAD Detector de fluorescencia Detector de Índice de Refracción Detector electroquímico amperiométrico Colector de fracciones programable, modelo WFCII HPLC VARIAN Prostar Detector de diodos array (modelo Prostar 335) Detector de fluorescencia (modelo 9012) Automuestrador ProStar 410 con refrigeración B) Equipo de cromatografía de gases con detector de masas (GC/MS): -Varian 450-GC con inyector modelo 1079 que permite trabajar en split/splitless, on-column, PTV y grandes volúmenes. Espectrómetro de masas 240-IT MS con ionización EI y CI + -Automuestrador CTCAnalytics CombiPal refrigerado, y con opción de realizar SPME y Headspace (análisis de compuestos volátiles) C) Espectrómetro de emisión óptica de plasma acoplado inductivamente (ICP-óptico) modelo Varian ICP 720-ES. D) Equipo de cromatografía de gases con detector de Conductividad Térmica, MicroGC. Entre los tipos de análisis actualmente disponibles en el SIC según los equipos utilizados tenemos: A. GC-MS - Análisis de desconocidos (screening). Se pueden identificar compuestos cuya presencia en la muestra se desconoce haciendo uso de la librería de espectros y mediante la interpretación del espectro de masas. - Análisis de conocidos (target análisis). El método cromatográfico y de análisis de masas se confecciona para obtener la máxima sensibilidad en la búsqueda de unos compuestos previamente seleccionados pero impide la identificación de cualquier otro compuesto no seleccionado. Es el caso del análisis GC-MS/Ms. Ya sea con análisis de conocidos o desconocidos, el tipo de compuestos a determinar es muy extenso. Pesticidas, PHAs, VOCs, volátiles en plantas, aminoácidos, azúcares, ácidos grasos, metabolitos en rutas de degradación o síntesis, y un largo etc. B. HPLC-MS - Trinitrotolueno (TNT) - Glutacion reducido y oxidado (GSH y GSSG). - Hormonas vegetales: ácido abscísico (ABA), ácido jasmónico, ácido salicílico y ácido 3-indolacético (AIA) C. HPLC-UV - Ubiquinona - Trinitrotolueno (TNT) - Pigmentos (clorofila) - Semipreparativa - Ácido ascórbico D. HPLC-Fluorescencia - Ácido salicílico E. MicroGC - Se utiliza para medir gases atmosféricos, fundamentalmente. El SIC se encuentra en la planta baja de la Casa Roja, adecuando cada una de sus dependencias a los equipos.

The services are: A) Liquid chromatography High performance liquid chromatography (HPLC) is a technique used to separate individual components from mixtures and based on differences in the interaction between analytes and chromatographic columns. HPLC Waters model 1525 equipped with a PAD detector (photodiode array detector) as well as detectors of fluorescence and refraction index; coupled to a fraction collector. HPLC with different detectors and fraction collector Organic compounds, particularly high conjugated ones, absorb light in the visible and ultraviolet electromagnetic spectrum. . The Beer-Lambert law shows the absorbance of a compound solution correlates directly with its concentration, which implies that visible/UV spectrometry can be used to determine component concentrations in solution, making use of commercial standard solutions of known purity. Possible types of analysis: Determination of nitrates and nitrites, size exclusion chromatography, analysis of fluorescent compounds, analysis of different sugars. Comments: the fraction collector is used for the separation of compounds for which its identity is established using alternative techniques. HPLC VARIAN Prostar with diode array detector (model Prostar 335), fluorescence detector (model 9012) and refrigerated autosampler ProStar 410. The types of analysis that can be done using this instrument are similar to those of the previous one, except that this HPLC is not equipped with a refractive index detector and fraction collector. The diode array detector is similar to that of the PDA detector of the above instrument.. B) * The gas chromatograph is equipped with an injector (model 1079) that permits injections in split/splitless mode and in large volumes, due to the possibility to increase the vaporization temperature, which in turn enhances the sensitivity of analysis significantly. * The mass spectrometer permits internal ionization by electronic impact or by chemical ionization (the first ionization mode generates more complex spectra with a large number of ions, this type of spectra is well suited for the identification of compounds, whereas the second ionization mode is softer and gives consequently rise to fewer ions. The spectra are frequently restricted to the molecular ion and can be used to determine the molecular weight of target compounds.. * The mass detector can acquire in Full Scan mode (over a wide ion range) and in mode SIS (Selected Ion Storage: only one ion or a narrow ion range is recorded) and can in addition support Ms/Ms and even Msn type of analyses (n<10). The GC-MS can work in two different modes: - Screening and analysis of unknown compounds. Unknown compounds can be identified in complex samples with the help of compound libraries and the interpretation of obtained spectra. - Analysis of known compounds (target analysis). The chromatographic method and the mass spectrometric analysis are optimized to permit maximal sensitivity in the search for selected compounds. This approach, however, does not permit the identification of additional compounds. C) ICP-OES OVERVIEW: * ICP-OES (inductively coupled plasma-optical emission spectrometry) is a commonly used technique for the determination of trace concentrations of elements in samples based on atomic spectrometry. Routine determination of 70 elements at the same time can be made by ICP-OES (except noble gases, halogens, C, N and O). LCMS: Electrospray ionization mass spectrometer with triple quadrupole detector coupled to HPLC (Waters Allience 2695) equipped with dual wavelength detector. D) MicroGC: Gas chromatograph with thermal conductivity detector. It is primarily used to analyse atmospheric gases.

SERVICIO DE LIOFILIZADOS

Especialización

A0. Especialidad del Área y Subárea Científica CSIC

A4. Ciencias Agrarias
Disciplina ERC
LS - LIFE SCIENCES

Investigadores Principales

TRESCASTRO MEDIAVILLA, ANTONIO MIGUEL

Objetivos

El servicio se presta en cuatro modalidades: Exposición de Liofilizados. Incluye portes y montaje y desmontaje de la exposición. Charla explicativa a cargo del personal técnico encargado. El importe incluye desplazamiento y dieta del personal desplazado. Explicación in situ. Atención al público visitante de la exposición durante la duración de la misma. Liofilización de muestras a demanda. Incluye la preparación de las muestras, congelación y liofilización de las mismas. Las tarifas de estas modalidades son: Exposición: 250 euros/día. Charla explicativa: 300 euros por conferencia. Explicación "in situ": 150 euros/día. Liofilización de muestras: 10 euros hora de liofilizadora

The service has 4 different varieties: •Exhibition of lyophilized samples. It includes travel/shipping charges, exhibition set-up and disassembly •Technical presentations by specialized personnel in charge. It includes subsistence and travel allowance. •In situ information and explanation. Attention to the general public during the visit. •Lyophilization of samples on demand. It includes preparation, deep-freezing and lyophilization of the samples. Costs : •Exhibition: 250 €/day •Technical presentations by specialized personnel: 300 €/conference •In situ information and explanation: 150 €/day •Lyophilization of samples: 10 €/h of liophylation

SERVICIO DE SECUENCIACIÓN DE ADN

Especialización

A0. Especialidad del Área y Subárea Científica CSIC
A4. Ciencias Agrarias
Disciplina ERC
LS - LIFE SCIENCES

Investigadores Principales

AROCA ALVAREZ, RICARDO

Objetivos

Las muestras se entregan directamente en el servicio con el correspondiente formulario rellenado que se obtiene de la página web del servicio. Entre los Servicios ofertados se encuentran: A) la secuenciación rutinaria (Sanger), a mayor escala (a partir de 49 muestras) o bien a la carta. B) Servicio NGS derivado de GS Junior Genome Sequencer 454 FLX System Roche: B.1.- 454 amplicon sequencing libraries (Amplitags) desde abril de 2013. Procesado de hasta 20 muestras distintas /per run. B.2.- 454 general (shotgun) sequencing libraries desde diciembre de 2013. Para obtener hasta desde 60 Mb de información.

The samples should be deliver to the service directly together with the corresponding form filled which can be downloaded from the web site of the service. The service are: A) Routine sequencing (Sanger). B) Amplicon sequencing libraries (Amplitags), of about 20 samples pre run. C) Shotgun

SERVICIO DE VEHICULOS PARA TRABAJOS DE CAMPO CIENTIFICOS

Especialización

A0. Especialidad del Área y Subárea Científica CSIC
A4. Ciencias Agrarias
Disciplina ERC
LS - LIFE SCIENCES

Investigadores Principales

RAMIREZ MELGUIZO, JAIME CECILIO

Objetivos
