

## ANEXO

### 1. PROJECT DATA

**TITLE OF THE PROJECT (ACRONYM):** Molecular basis of the Regulation of the Environment-Plant Interactions at Global scale (*Global-REPaIr*)

**IP: Gustavo Gomez (ORCID 0000-0003-3715-7792)**

### 2. TRAINING CAPACITY OF THE INVESTIGATION GROUP

#### 2.1. Training program foreseen for the PhD in the context of the requested project.

The PhD-student joining our team will be able to apply the knowledge acquired during his/her higher studies, as well as expand it by learning new approaches to fundamental and applied problems in crops technology. The PhD-student will benefit from a working environment supported by diverse financial sources (See IP CV). We propose that he/she will validate, and engineer ncRNA-mediated circuits related to coping with diverse environmental conditions in melon and tomato. In addition, he/she will conduct research on computational analysis of sequencing data and systems biology approaches to infer regulatory networks involved in modulating plant-environment interactions. The PhD Thesis associated with this proposal will be carried out in the PhD program in Biotechnology of the UPV, for which the transversal and specific activities established in its regulations will be developed. The PhD student will attend the cycle of seminars organized by the I2SysBio where they will be able to interact with renowned national and international researchers who regularly attend as speakers. Additionally, as an internal group policy, we encourage students to take besides basics closely-related training (Bioinformatics, molecular biology, genomic, phytopathology, etc.), additional training programs given by the URICI-CSIC aimed at training research staff in relevant aspects such as Open and/or Reproducible Science. Finally, I2SysBio is subscribed to "Nature Masterclasses" portal, an exclusive service for PhD-students. This initiative promoted by the Editorial Nature group offers "online" courses aimed at various aspects of the training cycle of a researcher from the design of an experiment, the interpretation of results and their subsequent communication. Focused in a more global formative objective, we also encourage the PhD students to participate in outreach activities (e.g., Science Week, Expo-Science, etc.) with the aim of bringing their research work closer to society. At the departmental level, we hold biweekly meetings in which a member of each group presents their results in a more informal environment that, in addition to allowing us learning about other lines of work, facilitates the exchange of ideas. As for research group, in addition to group meetings, each group member meets weekly with the PI, to evaluate progress, discuss/design future strategies or solves problems. We collaborate in some topics with the groups of S.F. Elena and G. Rodrigo (I2SysBio), G. Martinez (SLU, Sweden), L. Basabe/F. Benito (Microfluidic cluster), J. Armengol (IAM-UPV), D. Boulcombe (Department Plant Sciences, Cambridge University) and J.A. Daròs (IBMCP, CSIC-UPV), thus ensuring a favorable and stimulating environment for the scientific development of the PhD student. It is usual in our group that PhD students to carry out stays (2-3 months) in foreign centers, within the mobility plans of AEI or Generalitat Valenciana. It is expected that a part of the objective related with the tsRNAs will be carried out during a temporary stay of the PhD in the Regulatory RNA Lab at Uppsala, Sweden. Finally, it is expected that in addition to scientific publications, the student will present their results in national and/or international conferences.

#### 2.2. Human resources and infrastructures available for project implementation.

**IP of the project:** Dr. Gustavo Gomez (Group Leader of the ncRNA-Lab and Director of the Program Molecular interactions and Regulation of the I2SysBio). ORCID: 0000-0003-3715-7792.

**Work group:**

*Post-Docs:* Dra. M<sup>a</sup>Carmen Herranz (Senior Post-Doc) ORCID: 0000-0002-6812-5753: PhD in Biochemistry and Molecular Biology (University of Valencia). She has a large experience in the study of the molecular mechanisms regulating virus-plant interactions and the development of new resistance sources. She has published 28 articles in journals indexed in the WOS.

- Dra. Francesca Longo (Senior Post-Doc) ORCID: 0000-0002-8733-5959: PhD in Biology (University of Rome, Italy). She is specialized in molecular biology and microbiology, with 9 years of laboratory research experience. She has directed 4 TFM and 2 PhD Thesis. She has participated in 35 national/international conferences and published 11 articles in WOS-indexed journals.

*Pre-Docs:* - MS. Pascual Villalba Bermell (PhD student-Project associated contract): MS in Bioinformatics specialized in the computational analysis of genomic/transcriptomic data. He has published 2 articles in WOS-indexed journals and participated in 5 national and 1 international congresses

- MS. Gabriela Hernández (PhD student – Fellowship GVA ACI2021/202): MS in Biomedical Research specialized in tissue culture and molecular biology. She was the responsible of the generation of the first melon transgenic plants overexpressing endogenous miRNAs. She has participated as co-author in 1 publication in a journal indexed in WOS and accredits participation in 3 national congresses.

- MS. Julia Corell Sierra (PhD student – Fellowship GVA ACI2022/279): MS in Bioinformatics specialized in the computational analysis of genomic and transcriptomic data. She has participated as co-author in 1 publication in a journal indexed in WOS and participated in 4 national congresses.

*Technicians:* Cristina Atienza (Technical assistant): Technician in Diagnostic laboratory. She has contrasted experience as laboratory assistant and management tasks in public and private ambit.

*Additional technician assistance provided by the I2SysBio:* The I2SysBio offers a technical assistance department composed of five technicians responsible of greenhouse, sterilization, buffers/mediums preparation and management/recollection of biological and/or danger waste.

*External collaborators:* For this proposal we will also have the external collaboration of the Drs. J. Armengol, P. Abad and I. Font all of them researchers at the Instituto Agroforestal Mediterráneo (IAM) of the Polytechnic University of Valencia. They are specialist in phytopathogenic fungi and plant-virus and will provide support in the process of inoculation and maintenance of infected plants. These investigators participate with us in other two projects focused on the premature detection of the damage associated to stress in grapevine and tomato, see IP CV. Furthermore, to address the objective related to tsRNAs, we would count with the external collaboration of the Dr. G. Martinez SLU-Uppsala. He is a recognized expert in characterization of tsRNAs who in addition to participating as external member in our project is also co-author of 3 recent papers of our group (36, 149, 150).

*I2SysBio resources in equipment and infrastructures:* Our laboratory has basic equipment such as micropipettes, microfuges, refrigerated centrifuges, heat-blocks, thermo-cyclers, UV-Cleaner box/PCR-cabinet, materials for DNA-RNA/protein electrophoresis, ovens for growing bacteria and -20°C and -80°C freezers. The I<sup>2</sup>SysBio is fully equipped with state-of-the art research infrastructure and facilities, including three Quantitative PCRs, five 37°C and 20°C walk-in LED-illuminated and temperature-controlled BSL2 chambers for plant growth and exposition to changing environments. As of this year, I2SysBio also has an ultimate-generation greenhouse equipped with biological containment growth chambers, suitable for the safety maintenance of infected plants. As a center for computational biology resources, the Bioinformatics Core Unit host a high-performance computer cluster with a total aggregated capacity of +500 cores and +5500 GB of RAM and +2.3 Petabytes (PB) of storage. The I2SysBio, as a CSIC-UV center, counts on several core facilities and services from the University of Valencia (e.g., genomics, proteomics

metabolomics, confocal and electron microscopy, greenhouse services, etc.) that are available inside the Scientific Park, where the institute is located. In summary, we have at our disposal all the required equipment/technologies needed for the experimental and computational work proposed here.

### **2.3. Previous results of the investigation group in the thematic of the proposal.**

Since its constitution in the year 2014, the main research objective of our group focused on deciphering the regulatory role played by miRNAs in the response to single/combined stress conditions. We selected melon as a model, based in the idea of generating knowledge in an economically important crop with the objective that the results obtained would be transferable to productive system at medium term. First, we identified a group of miRNAs frequently involved in the response to stress (34, 37, 41). These miRNAs named *Generalists* were also identified as stress-related in other crops (maize and soybean) (35). Thus suggesting that the involvement of these sRNAs in the response to stress could be not only restricted to melon. To increase our knowledge about the role of the *Generalists* miRNAs in the regulation of the response to stress, we selected 2 *Generalist* miRNAs (miR398/miR408) for further characterization. A major goal of our last project was rewiring the regulatory pathways mediated by both miRNAs in melon. We generated (in collaboration with M. Martin CRAIG-IRTA) transgenic plants overexpressing both (miR398/miR408) precursors. Next, we demonstrated that this overexpressed precursors are integrated in the miRNAs biogenesis pathway inducing the over-accumulation of the miR398/miR408 mature miRNAs that are able to mediate silencing of their well-established target transcripts. These transgenic lines constitute the first melon plants (one particularly recalcitrant specie for transformation) in that the biogenesis process of endogenous miRNAs has been modified in a stable and functional manner. This biological material will be the source for the objective 3 of this project, oriented to analyze the manner in that melon plants overexpressing miR398/miR408 interact with diverse altered and/or changing environments. This approach will be complemented with studies in eggplant, in that the expression of miR398/miR408 targets will be transitorily silenced by **Viroid-Induced Gene Silencing (VdIGS)** an innovative technique recently developed in our group (134). Additionally, and thanks to our experience in computational analysis, we will achieve a Big-Data analysis (including all accessible data-sets) focused in generate a comprehensive map of the plant miRNAs reactive to adverse/changing environments.

The knowledge generated in the last 8 years regarding the study of the regulation of response to stress mediated by miRNAs such as the interplay between viroids (a pathogenic cirRNA) and their hosts (126, 143–148), has provided to our group of the expertise necessary to extend our studies to other ncRNAs and generate a more global vision about the regulation of the plant-environment interactions. For this reason, in this proposal we decided to extend our investigation to analyze the involvement of tsRNAs, circRNAs and lncRNAs in the modulation of the plant-environment interplay.

Regarding the regulation of the plant-environment interactions mediated by exogenous sncRNAs, increasing evidence support the existence of a poorly know cross-talk between the plant and certain soil fungi/bacteria. For this reason and as consequence of recent collaborations with the "Group of Phytopathogenic-fungi" of the IAM and the company Biologica Nature specialized in the investigation and development of sustainable agro-technology in microbiology, we propose as objective of this project to identify and characterize fungi/bacteria-derived sncRNAs involved in the regulation of such plant-microorganism interactions.

Finally, as was mentioned above, the main scientific objective of our group is to provide the primary sector with technological advances that can contribute to the development of a productive agricultural activity. Consequently, and as a derivative of the identification of *Generalists* stress-reactive miRNAs, we designed a detection strategy based in the use of these miRNAs as universal markers and the "*paper-based fluidics technology*", for the early and

premature detection of the damages associated to stress in melon, an initiative supported by the “Proof of Concept” program of the AEI. Thanks to this technology (with a patent in progress) our research group was recently awarded by AgrotecUV and selected to be included in this incubator of agro-business. Next, and thanks to the collaboration with the “*Group of Phytopathogenic-fungi*” of the IAM and the “*Microfluidics Cluster*” of the University of the Basque Country, the biotech company VALGENETICS, and the farmers’ association LA UNIO, we are working in to extend this technology to another crops and stress conditions, through two ongoing projects coordinated by our group and financed by the AEI and the AVI (Agencia Valenciana de Innovación). Furthermore, in collaboration with another research groups of the I2SysBio and the IBMCP, we demonstrate recently the functionality of the fluidic paper-based technology to detect TMV, TEV and PVX in infected plants (139). Consequently, and based in this knowledge we also included in this proposal an objective focused in the identification of stress-related tsRNAs that can be used as specific markers of the environment-associated damage in crops.

Fecha del CVA

17/01/2023

## Parte A. DATOS PERSONALES

Nombre	GUSTAVO		
Apellidos	GOMEZ		
Sexo (*)	Masculino	Fecha de nacimiento	
NIE	X2823496Q		
Dirección email	gustavo.gomez@csic.es	URL Web	www.ncrnalab.com
Open Researcher and Contributor ID (ORCID) (*)	0000-0003-3715-7792		

\* datos obligatorios

### A.1. Situación profesional actual

Puesto	Investigador Científico OPI (CSIC)		
Fecha inicio	12/07/2012		
Organismo/ Institución	CSIC		
Departamento/ Centro	Institute for Integrative Systems Biology (I2SysBio) CSIC-UV.		
País	España	Teléfono	+34 963544777
Palabras clave	RNA Silencing/Stress Response, ncRNAs, Plant-Pathogen Interactions, RNA-mediated Regulation, Agriculture/Climate Change		

### A.2. Situación profesional anterior

Periodo	Puesto/ Institución/ País / Motivo interrupción
2021 -	INVESTIGADOR CIENTIFICO (OPI) - I2SysBio (CSIC) - España
2012 - 2021	CIENTIFICO TITULAR (OPI) - IBMCP e I2SysBio (CSIC) - España
2009 - 2012	JAE-DOC (Antiguo I3P) - IBMCP (CSIC) - España
2006 - 2009	CONTRATO PARA OBRA O SERVICIO - IBMCP (CSIC) - España
2002 - 2006	PDI TEMPORAL - IBMCP (UPV) - España
2000 - 20002	BECARIO Post-Doctoral Externo CONICET - IBMCP (CSIC) - España
1999 - 2000	DOCENTE GENETICA - Universidad de Córdoba - Argentina
1994 - 1999	BECARIO Pre-Doctoral Externo CONICET - IFFIVE (INTA) - Argentina

### A.3. Formación Académica

Grado/Master/Tesis	Universidad/Pais	Año
First Degree	Universidad de Misiones (Argentina)	1988-93
PhD	Universidad de Cordoba (Argentina)	1999
PhD-validated to Spain	Universidad de Valencia	2008

## Parte B. CV SUMMARY

Currently Investigador Científico (CSIC) at the I2SysBio. PhD in Argentine working in diagnostic/characterization of *Phytoplasmas* (4 JCR journals). As postdoc (2000-12) identified a phloem protein (PP2) as the first cucumber-factor involved in the long distance viroid movement (2 works Q1 journals). The identification of homologous RNA-binding proteins in melon (*Plant J*, 2005) allowed us proposing that these proteins regulate systemic RNA-trafficking in plants (*Front Plant Sci*, 2013). Discovered that viroids resist RNA silencing, reporting the first mechanism of resistance to silencing mediated by a structured-RNA (*Plant J*, 2007). Next, determined that viroid-symptoms are related to the RDR6 (*Plant Physiol*, 2008), providing the first demonstration of a direct interplay between RNA silencing and pathogenesis (*Trends Plant Sci*, 2009). These results promoted a line focused in the use of viroids as tools to study ncRNA-mediated regulation in plant (*Plant Physiol*, 2012; *New Phytol*, 2013). In all papers published during this period contributed as first or corresponding author ([ORCID](#)).

Since 2014 (when my group was created) studied the regulation of the stress-response regulated by sncRNAs in crops. This investigation line was initially funded by 2 projects (AGL2013-47886-R and AGL2016-79825-R) in which I was the IP. Through NGS of sRNAs combined with transcriptional and degradome inferred the first miRNA-network of stress-response in melon (*BMC Plant Biol* 2019). By means of a temporal study of the stress-response and transferring this analysis to soybean and corn, determined that this miRNA-network is evolutionary conserved in plants (*RNA Biol*. 2019; *Front. Plant Sci*. 2022). We shown that cold affects the processing of miR319 producing alternative miRNAs, evidencing a novel miRNA-associated response to stress in plants (*Scientific Rep*, 2018). Also described



the existence of the first melon tasiRNA involved in the response to cold (*Plant & Cell Physiol*, 2019). Furthermore, established that viroids induce the demethylation of rDNA in cucumber, demonstrating for the first time epigenetic alterations induced by a pathogenic RNA (*Nucleic Acids Research*, 2014). Next, determined that this alteration is consequence of the direct interaction viroid/host-HDA6 (*New Phytol*, 2016) and that it also occurred in reproductive tissue of infected plants (*J Exp Botany*, 2016). In the current project as IP (PID2019-104126RB-I00) addressed an integrative analysis (sRNAome-transcriptome-methylome) of the stress-response. This multiomic approach allowed us to obtain a comprehensive vision about the interplay plants/stress-inductor agent (*Mol. Biol. Evolution*, 2020 and *eLife in revision*). Furthermore, we rewired the regulatory pathways mediated by 2 melon miRNAs (miR408/miR398). Thus, constituting the first melon plants (specie recalcitrant for transformation) in that miRNA expression was functionally modified (*Ms in preparation*). All these publication (plus others not cited by space limits) were performed in the frame of 8 PhD-Thesis (5 finalized & 3 in process), that I have tutored in the last 10 years. The 5 PhD, are currently working in science, 2 as Group leaders (in Sweden and Ecuador) and 3 in Post-doc stays (in Sweden and Spain), see attached memory for details. We has maintained international collaboration with investigation groups leded by D. Baulcombe (UK), C. Kholer (Germany), D. Colimba (Ecuador), K. Kalantidis (Greece), B. Owens (USA) and G. Martinez (Sweden), thus allowing the publication of papers and/or book chapters.

Another objective is providing to primary sector of technology that can contribute to the development of sustainable agriculture. We designed a detection strategy (based in the stress-responsive miRNAs as markers and “*in paper fluidics technology*” as support), for the easy and premature detection of the damages associated to stress in melon (AEI *Proof of Concept* PDC2021-120837-I00). Thanks to this technology (with patent in progress), were are currently creating an EBT that was recently awarded by [AgrotecUV](#) and selected to be included in this incubator of agro-related business. Next, and thanks to the collaboration with the bio-tech company [VALGENETICS](#), the microfluidic cluster of the Basque Country University and the farmers association [LA UNIO](#), we are working in to extend this technology to another crops and stress conditions, by means of 2 project coordinated by this IP and funded by the AEI (TED2021-129273B-C31) and the Agencia Valenciana de Innovación (INNEST/2022/167). In short: 10 projects as IP, 53 articles in peer review journals, 1364 citations, and H-index: 19.

Since 2017 I am Director of the Department Molecular Biology and Interactions and member of the Institute Board at the I2SysBio. Editor of *Agronomy* and *Frontiers* and *Microbiology* journals. Member of the Panel for CSIC Scientific Challenges: Towards 2030 (Topic 3 Genomic and Epigenetics). I also teach in the master's degree in virology at UV.

## Parte C. MOST RELEVANT CONTRIBUTIONS

### C.1. Relevant Publications in “peer review” journals (10 selected from the last 8 years).

1- Marquez J, Hernandez A, Urrutia M, Pallas V & **Gomez G** (2022) A circular RNA vector for targeted plant gene silencing based on an asymptomatic viroid. *The Plant Journal* 112: 284-293. DOI: 10.1111/tpj.15929. 1º Decil JCR *Plant Sci*.

2- Villalba P, Marquez J, Marques MC, Corell J, Hernandez A, Pico B, Monforte A, Elena S & **Gomez G** (2021) Combined stress conditions induce non-additive effects in the core miRNA regulatory network. *Front. Plant Sci.* 12: 769093. DOI: 10.3389/fpls.2021.769093. 1º Decil JCR *Plant Sci*.

3- Marquez J, Navarro JA, Seco LC, Pallas V & **Gomez G** (2021) Might exogenous circular RNAs act as protein-coding transcripts in plants? *RNA Biol.* 14:1-10. DOI: 10.1080/15476286.2021.1962670. Q1 JCR *Mol. Biol.*

4- Corrêa R., Sanz A., Kogej Z., Müller S., Ambrós S, López S, **Gómez G**, Baulcombe D & Elena S (2020) Viral fitness determines magnitude of transcriptomic and epigenomic reprogramming...*Molecular Biol. Evolution* 37: 1866-81. DOI: 10.1093/molbev/msaa091. 1º Decil JCR *Genetics & Heredity*.

5- Sanz A, Marques MC, Martinez G & **Gomez G** (2020) Dynamic architecture and implications of the miRNA network underlying the response to stress conditions in melón. *RNA Biology* 2: 292-308. DOI: 10.1101/745653. Q1 JCR *Mol. Biol.*

6- Cervera L, Marques M, Sanz A, Marquez J, Carbonell A, Daròs JA. & **Gomez G** (2019) Identification and characterization of a stress-responsive TAS3 tasiRNAs in melon. *Plant Cell & Physiology* 60: 2382-2393. DOI: 10.1093/pcp/pcz131. Q1 JCR *Plant Sci*.



7- Sanz A, Marques MC, Bustamante A, Fares M, Rodrigo G & **Gomez G** (2019). Inferring the miRNA-mediated regulatory network of response to stress in melon. *BMC Plant Biology* 19: 78. DOI: 10.1186/s12870-019-1679-0. Q1 (1º Decil) JCR Plant Sci.

8- Bustamante A, Marques M, Sanz A & **Gomez G** (2018). Alternative processing of its precursor is related to miR319 decreasing in plants exposed to cold. *Scientific Reports* 8(1): 15538. DOI: 10.1038/s41598-018-34012-7. Q1 JCR *Multidisciplinary Sci*.

9- Castellano M, Pallás V & **Gómez G** (2016) A pathogenic long ncRNA redesigns the epigenetic landscape of the infected cells by subverting host Histone Deacetylase 6 activity. *New Phytologist* 211: 1311-1322. DOI: 10.1111/nph.14001. 1º Decil JCR *Plant Sci*.

10- Martinez G, Castellano M, Tortosa M, Pallas V & **Gomez G** (2014) An exogenous ncRNA induces changes in dynamic DNA methylation of ribosomal RNA genes in plants. *Nucleic Acids Research* 42: 1553-62. DOI: 10.1093/nar/gkt968. 1º Decil JCR *Mol. Biol*.

### C.2. Congress (5 selected from the last 5 years)

Authors: J. Márquez-Molins, P. Villalba, J. Corell-Sierra, V. Pallás **G. Gómez**.  
Congress: VIROID 2022: Viroids and viroid-like RNAs. Heraklion-Creta, September 2022.  
Title: Multi omic analysis reveals that viroid infection induces a temporal reprogramming...  
Participation: Oral

Authors: Villalba P., Marqués MC., Marquez J., Moreno I., Hernandez G., Elena S., **Gomez G**.  
Congress: 26th Annual Meeting of the RNA Society. May/June 2021. *On line*  
Title: Inferring the miRNA-mediated response to combined stress conditions in melon.  
Participation: Oral

Authors: J. Marquez, L. Orduña, L. Cervera, G. Fernández, MC. Marques, A. Sanz, **G. Gomez**.  
Congress: International Symposium Small Molecules in Plants, *December 2019. Valencia-Spain*  
Title: Relationship between differential methylation and siRNAs in melon plants exposed...  
Participation: Oral

Authors: Fernández-Guzmán, G., A. Sanz, J. Marquez, L. Cervera, **G. Gomez**, MC. Marques.  
Congress: International Symposium Small Molecules in Plants, *December 2019. Valencia-Spain*  
Title: Functional implications of stress-dependent miRNA misprocessing in *C. melo* plants...  
Participation: Oral

Authors: A. Sanz, A. Bustamante, M. Marques & **G. Gomez**  
Congress: *Meeting Bioinformatics@Valencia, July 12th, 2018, Valencia – Spain.*  
Title: Inferring regulatory network of the miRNA-mediated response to stress in melon.  
Presentation: Oral

### C.3. Projects as IP (last 8 years)

#### Internationals (1)

1-Title: Diagnostico de enfermedades virales y sub-virales en Imbabura  
Funder: Secretaria Nacional Ciencia y Tecnología (SENECYT) - Ecuador  
Center: Universidad Nacional del Norte (Ibarra - Ecuador) - IBMCP (Spain)  
Period: 1/06/2014 - 30/12/2017 Funding: 154.900 \$  
IP: Dr. Gustavo Gómez Nº Investigators: 4

#### Nationals (8)

1-Title: BotVidSENSOR: Portable sensor for detection of *B. cinerea* in grapevine.  
Funder: Agencia Valenciana de Inovacion (AVI) (INNEST/2022/167)  
Center: Institute for Integrative Systems Biology (CSIC-UV).  
Period: 01/10/2022 - 30/10/2024  
Coordinator: Gustavo Gomez Nº of Partners: 4 Total Funding: 564.837€  
IP Subproject: Gustavo Gómez Funding Subproject: 267.838€



- 2-Title:** PreDeSTom: Development of a dual strategy for the mitigation of the damage associated to stress, in tomato productive systems.  
**Funder:** AEI - Projects Ecologic and Digital Transition (TED2021-129273B-C31)  
**Center:** Institute for Integrative Systems Biology (CSIC-UV).  
**Period:** 01/12/2022 - 30/12/2024  
**Coordinator:** Gustavo Gomez N° of Partners: 3 Total Funding: 510.307€  
**IP Subproject:** Gustavo Gómez Funding Subproject: 207.000€
- 3-Title:** Plant-PREDICTOR: A large-scale monitoring system of stress-related sRNAs for the early and easy diagnostic of stress in crops.  
**Funder:** AEI - Project I+D+D Proof of Concept (PDC2021-120837-I00)  
**Center:** Institute for Integrative Systems Biology (CSIC-UV).  
**Period:** 30/12/2021 - 30/12/2023 Funding: 138.000€  
**IP:** Dr. Gustavo Gómez N° Investigators: 6
- 4-Title:** EGRen-Mel: Environment-related Gene Regulatory Networks involved in multilevel modulation of the stress response in Melon....  
**Funder:** Programa Estatal I+D+I Orientada Retos Sociedad (PID2019-104126RB-I00)  
**Center:** Institute for Integrative Systems Biology (CSIC-UV).  
**Period:** 01/06/2020 - 30/05/2023 Funding: 217.000€  
**IP:** Dr. Gustavo Gómez N° Investigators: 6
- 5-Title:** nc-STREREGULOME: Functional validation of the sncRNA-mediated regulatory networks involved in stress-response in melon...  
**Funder:** MINECO PROYECTOS DE I+D+I, Retos de la Sociedad (AGL2016-79825-R)  
**Center:** Instituto de Biología Molecular y Celular de Plantas (IBMCP)  
**Period:** 30/12/2016 - 30/12/2019 Funding: 154.900€  
**IP:** Dr. Gustavo Gómez N° Investigators: 4
- 6-Title:** miRome: Identification & characterization of stress-responsive miRNAs.  
**Funder:** CSIC (201540I003)  
**Center:** Instituto de Biología Molecular y Celular de Plantas.  
**Period:** 1/10/2015 - 30/09/2016 Funding: 7.500€  
**IP:** Dr. Gustavo Gómez N° Investigators: 1
- 7-Title:** Chloro-Traget: Optimization of a ncRNA-mediated system for selective expression and accumulation of heterologous proteins in chloroplasts...  
**Funder:** MINECO PROYECTOS I+D+I, Explora (BIO2014-61826-EXP).  
**Center:** Instituto de Biología Molecular y Celular de Plantas (IBMCP)  
**Period:** 1/09/2015 - 30/09/2017 Funding: 78.650€  
**IP:** Dr. Gustavo Gómez N° Investigators: 3
- 8-Title:** nc-STREsome: Analysis of the plant-stress response by ncRNAs...  
**Funder:** MINECO PROYECTOS I+D+I, Retos (AGL2013-47886-R)  
**Center:** Instituto de Biología Molecular y Celular de Plantas (IBMCP).  
**Period:** 1/1/2014 - 31/12/2017 Funding: 205.700 €  
**IP:** Dr. Gustavo Gómez N° Investigators: 5

#### **C.4. Activities for technology/knowledge transfer and results exploitation.**

##### **1- Patents**

**Authors:** Gustavo Gomez & Maria Carmen Marques  
**Title:** Stress-related miRNAs as markers for detection of stress-associated damage in crops.  
**Status:** In process by the *Unit for Results Protection and EBTs* (CSIC).  
**Observations:** VALGENETICS is Interested in development. Agreement signed at 05/06/2022.

##### **2- Creation of EBTs:**

Plant-PREDICTOR is a project of EBT (led by this IP) that has been awarded and selected for mentoring by AgrotecUV (agro-business incubator)