

SUMMARY OF THE TRAINING PROGRAM:

The FPI will be trained in the abilities to conceive, design, and put into practice original research, to perform a critical analysis and evaluation of new ideas, and with the capacity to communicate their work with the scientific community and with society in general. I believe that this project provides an optimal frame for training at the PhD level. Our proposal combines state-of-the-art molecular techniques with phenotyping, physiological characterization, and high-throughput data analyses, representing an excellent training opportunity given the ever-growing demand for researchers who gather an extensive knowledge of different techniques. The Ph.D. thesis will be focused on objectives 2 and 3 of this proposal. The student will join the "Agricultura y Medioambiente para el Desarrollo" Doctoral Program of the University of Santiago de Compostela. Within the frame of this program and in the context of the project, students will have to carry out several activities directed to complete their training as scientists. The training plan is outlined in the following table:

1. Training in technical activities related to the progress of the project.
As mentioned above the student will be training in the molecular, genetic, physiological, and data analysis techniques needed to grow up as a scientist and pursue the objectives of the project.
2. Presentation of the Research Plan and the results reports
The student will have to present written reports in English every 6 months detailing the implemented tasks, the results obtained, and if any, the difficulties encountered and alternative plans to resolve them. Additionally, weekly meetings with the PI are planned to do appropriate guidance and follow-up of the student's activities.
3. Publications in peer-reviewed journals
The student will be trained in writing manuscripts, preparing figures, and in the publishing process of peer-reviewed journals. They will have to prepare and submit at least two main papers derived from the Ph.D.
4. Presentation of the project's results in the MBG-CSIC seminar series for PhD students
The student will have to report her/his results to other colleagues in the MBG-CSIC at least twice during the Ph.D. period.
5. Communications to national and international scientific congresses
The student will present at least one oral/poster communication in national or international conferences or workshops per year.
6. Attendance to research seminars.
The student will attend the scientific seminars that the MBG organizes. Additionally, she/he will follow seminars organized online by other CSIC centers and/or national or international institutions. Additionally, the student will be encouraged to participate in Doctoral Summer Schools organized by CSIC and/or USC to present the work and interact with students from other fields.
7. Mobility
The student will perform a research stay (at least three months) in the laboratory of Dr Laurens Pauwels for technical guidance of CRISP/Cas9 technology following the proposed working plan.
8. Reception of courses for the development of the Thesis
The student will be enrolled in the course on biosecurity and good practices for research laboratories, which is crucial in the training of researchers, and in any other course that expands her/his transversal skill (e.g. data analysis, laboratory techniques, handling of instruments, structure, and style of scientific and technical research articles, etc.) to improve his/her training in the context of the project, for example, the courses organized by Departamento de Postgrado y Especialización del CSIC and or the courses offered in the formative plan of the CSIC.

9. Formation in gender equality and diversity.

We will encourage the involvement of the students in activities aimed at breaking ceiling glasses in science for minorities. The guidelines established by Equality plans and protocols of the CSIC.

10. Social Research Dissemination

The student will participate at least once per year in outreach activities (e.g. "European Researchers Night", "Feria de la Ciencia", International Day of Girls and Women in Science", "Biodiversión", etc.)



CURRICULUM VITAE (CVA)

IMPORTANT – The Curriculum Vitae cannot exceed 4 pages. Instructions to fill this document are available in the website.

Part A. PERSONAL INFORMATION		CV date	16/07/2024
First name	Patricia		
Family name	Fernández Calvo		
Gender (*)	Female	Birth date (dd/mm/yyyy)	13/05/1979
Social Security, Passport, ID number	44818708B	URL Web: https://mbg.csic.es/es/	
e-mail	pfcervo@mbg.csic.es		
Open Researcher and Contributor ID (ORCID) (*)	0000-0002-1576-9651		

(*) *Mandatory*

A.1. Current position

Position	Ramón y Cajal researcher with I3 certificate		
Initial date	01/01/2023		
Institution	Misión Biológica de Galicia (CSIC)		
Department/Center	Producción Vegetal		
Country	Spain	Teleph. number	981 59 09 58
Key words	Plant molecular biology, genetics, stress, signaling, crops, biotechnology		

A.2. Previous positions (research activity interruptions, art. 14.2.b))

Periodo	Puesto/ Institución/ País / Motivo interrupción
2022/04-2022/12	R&D Manager Joint Research Unit BIOS4SUSTAIN/Polytechnic University of Madrid (UPM)-CBGP/Tradecorp (Rovensa-Next)
2022/01-2022/03	Senior Postdoctoral researcher in INBIOME CROPS facility at CBGP-UPM, Madrid, Spain
2019/11-2021/12	L'Oreal-Unesco senior Postdoctoral at UPM, Madrid, Spain
2019/02-2019/10	Senior Postdoctoral at UPM, Madrid, Spain
2016/06-2018/10	FWO (Flemish Research Foundation)-Postdoctoral fellow at VIB-Gent, Belgium
2014/06-2016/05	Marie-Curie (IEF) FP7-EU Postdoctoral fellow at VIB-Gent, Belgium
2013/10 - 2014/05	Postdoctoral researcher at IBENS-CNRS, Centre national de la recherche scientifique, Paris, France
2013/04 - 2013/07	EMBO Postdoctoral fellow-short stay at VIB-Gent, Belgium
2011/11 - 2013/03	Postdoctoral researcher at CNB-CSIC, Madrid, Spain
2005/11 - 2011/11	FPI-PhD fellow, Comunidad de Madrid at CNB-CSIC, Madrid, Spain
2004/04 - 2005/10	Graduate contract (I3P program) at CAB-CSIC, Madrid, Spain
2002/09 – 2004/03	Master Student fellow / XUNTA DE GALICIA

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
PhD	CNB/CSIC-Autonomous University of Madrid	2011
Master of Sciences	University of Santiago	2004
Higher Degree in Biology	University of Santiago	2002

Part B. CV SUMMARY (max. 5000 characters, including spaces)

Interested and fascinated by science I am a plant molecular biologist with more than 20 years of experience. My main research line was always focused on understanding the activation and modulation of the molecular pathways that are activated in plants in response to stress stimuli. I have discovered the



role of novel modulators of such pathways employing state-of-the-art technologies. Throughout my career, I was granted several fellowships showing my capacity to get national and international funding. First, **an FPI-CAM to carry out my Ph.D.** under the supervision of Dr. Solano at CNB-CSIC to unravel **new components of the jasmonate (JA) signaling pathway involved in stress responses in Arabidopsis**. Second, as a postdoc, I did a short stay in **IBENS-CNRS** in Paris, and later I obtained an **EMBO short-term, a Marie-Curie (IEF)/FP7 and FWO fellowships** to carry out my postdoctoral stay at **PSB-VIB** (Belgium) one of the world-leading departments in Plant Science, under the supervision of Dr. Alain Goossens. **There I worked with modulators of JA signaling and specialized metabolism**. All my postdoctoral projects were designed by me. I would like to mention that both Marie-Curie (IEF)/FP7 and FWO grants are highly prestigious fellowships that enabled me to grow from a junior to a senior and mature postdoc. In 2019, back in Spain at CBGP-UPM/INIA-CSIC, I was one of the awardees of the **L'Oreal-UNESCO for Women in Science program** with a project devoted to finding **new bio-compounds that might act as immunomodulators of plant defense**. Such an award allowed me to lead a small but independent project. In 2022 (April-December), I was **the R&D manager of the Joint Research Unit, BIOS4SUSTAIN**, between the CBGP and the company Tradecorp. I participated in the **identification and characterization of fungal-derived molecules with bio-stimulant properties in plants**. This work experience allowed me to understand the importance of establishing bridges between the public and the private sectors to solve real agronomic questions. Within the JRU I obtained a **Torres Quevedo Fellowship**. Similarly, in 2022 **I was granted by the Ramón y Cajal (R&C) program, and I obtained the I3 certificate**. From January 2023, I'm an **R&C Research Fellow at Misión Biológica de Galicia (MBG)-CSIC**, where my major aim is to establish my research line and group. Last June, I enrolled in **AGROFOR** one of the Interdisciplinary Thematic Platforms (PTIs) created in the CSIC to team up with colleagues, companies, and agriculture stakeholders to develop new sustainable solutions for crop breeding. For the experience explained before I consider **myself a plant molecular biologist, though, during my scientific career, I also worked in other fields**. As a master's student, I joined a **molecular cardio-biology** lab at the Medicine Department of Universidad de Santiago de Compostela (USC) to unravel the molecular mechanisms triggered by antihypertensive drugs that cause apoptosis in cardiomyocytes (Eiras et al., 2004). After my master's, in 2004 I was awarded an I3P graduate contract to join the group of Dr. Victor Parro at the **Astrobiology Center (CAB-CSIC)**. There, I developed a protein-based microarray to detect traces of life in different samples (de Diego-Castilla et al., 2011; Parro et al., 2008; Fernández-Calvo et al., 2006). Furthermore, I was involved in a MARTE-drilling simulation mission in Rio Tinto (Huelva, Spain) with NASA researchers (Parro et al., 2008; Parro et al., 2005) and participated in the development and fine-tuning of SOLID2, a robot devoted to doing in situ sample analysis using the biomarker microarray technology previously developed (Parro et al., 2008). Throughout my career, I have been supervising several MSc as well. Students in Belgium (3) and Spain (2) and co-supervising a Ph.D. student (Yuechen Bai, UGent 04/09/2019, Bai et al., 2021). Currently, I'm the co-supervisor of Marina Martín-Dacal in Molina's lab at CBGP, she will defend her PhD project next September 2024. Overall, I have contributed to **21 scientific articles, 20 of them in Q1/D1 journals in the field of (Plant) Molecular Biology. I'm the co-corresponding author in two of the manuscripts**, a Plant Journal, and a Cell Surface (see below indicated with +). Remarkably, I **co-author of two manuscripts in the prestigious journals Nature Plants and Nature Communications. My H-index is 16 and the total citations of my work are 2384 (WOS)** indicating that my projects and findings are relevant to the scientific community I belong to. Moreover, the scientific, management, mentoring, and leadership skills developed during my career make me a good candidate to apply for and get a permanent position in the Spanish research system.

Part C. RELEVANT MERITS

C.1. Publications (most relevant publications, *indicates co-FIRST author, + co-corresponding)

1. Fernández-Calvo P⁺, López G, Martín-Dacal M, Aitouguinane M, Carrasco-López C, González-Bodí C, Bacete L, Mélida H, Sánchez-Vallet A, Molina A (2024). *Leucine rich repeat-malectin receptor kinases IGP1/CORK1, IGP3 and IGP4 are required for arabidopsis immune responses triggered by β -1,4-D-Xylo-oligosaccharides from plant cell walls*. **The Cell Surface**, 11: 100124. Peer-reviewed. **IF 4,72. Q1** in Biology. (WOS: not yet cited). **Co-corresponding author and first author**.
2. Nguyen TH, Thiers L, Van Moerkerecke A, Bai Y, Fernández-Calvo P, Minne M, Depuydt T, Colinas M, Verstaen K, Van Isterdael G, Nützmann HW, Osbourn A, Saeys Y, De Rybel B, Vandepoele K, Ritter A, Goossens A. (2023) *A redundant transcription factor network steers spatiotemporal Arabidopsis triterpene synthesis*. **Nat Plants**, 9(6):926-937. (15/05/2023). Peer-reviewed. **IF 17,35. Q1** in Plant Sciences. (WOS: 4 citations).

3. Martín-Dacal M*, **Fernández-Calvo P***, Jiménez-Sandoval P, López G, Garrido-Arandía M, Rebaque D, Del Hierro I, Berlanga DJ, Torres MÁ, Kumar V, Mélida H, Pacios LF, Santiago J, Molina A. (2023) *Arabidopsis immune responses triggered by cellulose- and mixed-linked glucan-derived oligosaccharides require a group of leucine-rich repeat malectin receptor kinases*. **Plant J**, 113(4):833-850. (29/12/2022). Peer-reviewed. **IF 6,83. Q1** in Plant Sciences. (WOS: 16 citations). **Co-corresponding author and co-first author.**
4. Swinnen G, De Meyer M, Pollier J, Molina-Hidalgo FJ, Ceulemans E, Venegas-Molina J, De Milde L, **Fernández-Calvo P**, Ron M, Pauwels L, and Goossens, A. (2022). *The basic helix-loop-helix transcription factors MYC1 and MYC2 have a dual role in the regulation of constitutive and stress-inducible specialized metabolism in tomato*. **New Phytol**, 236: 911-928. (15/07/2022). Peer-reviewed. **IF 9,4. Q1** in Plant Sciences. (WOS: 14 citations).
5. Bai Y, **Fernández-Calvo P**, Ritter A, Huang AC, Morales Herrera S, Bicalho KU, Karady M, Pauwels L, Buyst D, Njo M, Ljung K, Martins JC, Vanneste S, Beeckman T, Osbourn A, Goossens A, Pollier J (2020) *Modulation of Arabidopsis root growth by specialized triterpenes*. **New Phytol**, 230: 228-243. (04/12/2020). Peer-reviewed. **IF 7,69. Q1** in Plant Sciences. (WOS: 22 citations).
6. **Fernández-Calvo P***, Iñigo S*, Glauser G, Vanden Bossche R, Tang M, Li B, De Clercq R, Nagels-Durand A, Eeckhout D, Gevaert K, De Jaeger G, Brady SM, Kliebenstein DJ, Pauwels L, Goossens A, Ritter A (2020) *FRS7 and FRS12 recruit NINJA to regulate expression of glucosinolate biosynthesis genes*. **New Phytol**, 227: 1124-1137. (14/05/2020). Peer-reviewed. **IF 7,69. Q1** in Plant Sciences. (WOS: 17 citations).
7. Ortigosa A, Fonseca S, Franco-Zorrilla J-M, **Fernández-Calvo P**, Zander M, Lewsey MG, García-Casado G, Fernández-Barbero G, Ecker JR, Solano R (2019) *The JA pathway MYC transcription factors regulate photomorphogenic responses by targeting HY5 gene expression*. **Plant J**, 102: 138-152. (21/11/2019). Peer-reviewed. **IF 6,47. Q1** in Plant Sciences. (WOS: 46 citations).
8. Ritter A*, Iñigo S*, **Fernández-Calvo P***, Heyndrickx K, Dhondt S, Shi H, De Milde L, Vanden Bossche R, De Clercq R, Eeckhout D, Ron M, Somers D, Inzé D, Gevaert K, De Jaeger G, Vandepoele K, Pauwels L, Goossens A (2017). *The transcriptional repressor complex FRS7-FRS12 regulates flowering time and growth in Arabidopsis*. **Nature Communications**, 11; 8:15235. (12/05/2017). Peer-reviewed. **IF 11,050. Q1** in Multidisciplinary Sciences. (WOS: 53 citations).
9. Goossens J*, **Fernández-Calvo P***, Schweizer F*, Goossens A (2016). *Jasmonates: signal transduction components and their roles in environmental stress responses*. **Plant Mol Biol**. 91(6), 673-89. (16/04/2016). Peer-reviewed. **IF 3,905. Q1** in Plant Sciences. (WOS: 167 citations).
10. Chico JM, Fernández-Barbero G, Chini A, **Fernández-Calvo P**, Díez-Díaz M, Solano R. (2014) *Repression of Jasmonate-Dependent Defenses by Shade Involves Differential Regulation of Protein Stability of MYC Transcription Factors and Their JAZ Repressors in Arabidopsis*. **Plant Cell** 13, 1967-1980. (13/05/2014). Peer-reviewed. **IF 9,575. Q1** in Plant Sciences. (WOS: 156 citations).
11. Fonseca S, **Fernández-Calvo P**, Fernández GM, Díez-Díaz M, Gimenez-Ibanez S, López-Vidriero I, Godoy M, Fernández-Barbero G, Van Leene J, De Jaeger G, Franco-Zorrilla JM, Solano R. *bHLH003, bHLH013 and bHLH017 are new targets of JAZ repressors negatively regulating JA responses*. **PLoS One** 9(1):e86182. (23/01/14). **IF9,575. Q1** in Multidisciplinary Sciences. (WOS: 107 citations).
12. Schweizer F*, **Fernández-Calvo P***, Zander M, Díez-Díaz M, Fonseca S, Glauser G, Lewsey MG, Ecker JR, Solano R and Reymond P (2013). *Arabidopsis Basic Helix-Loop-Helix Transcription Factors MYC2, MYC3 and MYC4 Regulate Glucosinolate Biosynthesis, Insect Performance and Feeding Behavior*. **Plant Cell** 25, 3117-3132. **First co-authored. PhD-related publication***. (25/08/13). Peer-reviewed. **IF 9,575. Q1** in Plant Sciences. (WOS: 436 citations).
13. **Fernández-Calvo P**, Chini A, Fernández-Barbero G, Chico JM, Gimenez-Ibanez S, Geerinck J, Eeckhout D, Schweizer F, Godoy M, Franco-Zorrilla JM, Pauwels L, Witters E, Puga MI, Paz-Ares J, Goossens A, Reymond P, de Jaeger G and Solano R (2011). *The bHLH Transcription Factors MYC3 and MYC4 are targets of JAZ repressors and act additively with MYC2 in the activation of JA responses*. **Plant Cell** 23, 701-715. **PhD-related publication**. (23/03/11). Peer-reviewed. **IF 10,529. Q1** in Plant Sciences. (WOS: 909 citations). **Break-through paper in the field.**
14. Chini A, Fonseca S, Chico JM, **Fernández-Calvo P** and Solano R (2009) *The ZIM domain mediates homo- and heteromeric Interactions between Arabidopsis JAZ proteins*. **Plant J** 59, 77-87. (26/02/2009). Peer-reviewed. **IF 6,948. Q1** in Plant Sciences. (WOS: 284 citations).

C.2. Congress (representative communications to congress)



- 1. Patricia Fernández-Calvo**, Gemma López, Marina Martín-Dacal, Diego Rebaque, Laura Bacete, Hugo Mérida, Antonio Molina. Xylose-derived oligosaccharides trigger plant immunity. *XVI Plant Cell Wall Meeting*, 18th-23rd June 2023 Málaga, Spain. Poster.
- 2. Patricia Fernández Calvo, invited speaker** at the round table “Career Opportunities” in the *XVI Plant Cell Wall Meeting*, 18th-23rd June 2023 Málaga, Spain.
- 3. Patricia Fernández-Calvo**. BIOS4SUSTAIN is a joint research unit between Tradecorp and CBGP-UPM. *XVI Reunión de Biología Molecular de Plantas*, 14-16th September, 2022 Sevilla, Spain. Oral presentation.
- 4. Patricia Fernández-Calvo**, Evi Ceulemans, Gwen Swinnen, Trine Andersen, Linlin Qi and Alain Goossens. Mapping the key events in the development of the tomato crazy root disease by Y2H-sequencing. *Solcuc 2017: XIV Solanaceae and III Cucurbitaceae Genomics Joint Conference*, 3rd-6th September 2017 (Valencia-Spain). Poster.
- 5. Patricia Fernández-Calvo**, Andrés Ritter, Sabrina Iñigo, Ken S. Heyndrickx, Stijn Dhondt, Hua Shi, Liesbeth De Milde, Robin Vanden Bossche, Rebecca De Clercq, Dominique Eeckhout, Mily Ron, David E. Somers, Dirk Inzé, Kris Gevaert, Geert De Jaeger, Klaas Vandepoele, Laurens Pauwels & Alain Goossens. The transcriptional repressor complex FRS7-FRS12 regulates flowering time and growth in Arabidopsis. *At the forefront of Plant Research*, 14th-16th June 2016 (Gent-Belgium). Poster.
- 6. Fernandez-Calvo P.** The bHLH Transcription Factors MYC3 and MYC4 are targets of JAZ repressors and act additively with MYC2 in the activation of JA responses. *XI Meeting of Plant Molecular Biology*, 14th-16th June 2012, Segovia, Spain. Selected speaker for oral presentation.

C.3. Research projects

C.3.1. Research Projects and Grants as PI:

1. Signaling mechanisms in plant stress responses. **PI: Patricia Fernández Calvo**, from 2023/01/01 to 2027/12/31. “Ayuda a Gastos de investigación **RYC2021-033767-I**”. Ministerio de Ciencia, Innovación y Universidades **50049, 12 €**. **I3 certificate** (call 2022).
2. Contrato Programa 23-24:. **PI: Patricia Fernández Calvo**, from 2023/10/01 to 2024/12/31. CSIC **6214,80 €**.
3. Inmunidad por azúcares en plantas **L’OREAL-UNESCO for Women in Science Awarded project** November 2019. **PI: Patricia Fernández Calvo**, from November 2019 to December 2021. L’oreal-Unesco for Women in Science program **15000 €**.
4. Small Metabolite Affinity Purification (SMAP). **PI: Patricia Fernández Calvo, FWO junior fellow (salary and bench fee, equivalent to Juan de la Cierva program)**. Flemish Research Foundation, PSB-VIB, Gent, Belgium from 2016/06/01 to 2018/10/15.
5. TAPMIN, Tapping for Protein-Metabolite Interactions (TAPMIN). **PI: Patricia Fernández Calvo**, Program IEF-MC/FP7, **Marie-Curie IEF actions, EU**. PSB-VIB, Gent, Belgium, from 2014/06/01-2016/05/31. **227800 €**.

C.4. Contracts, technological, or transfer merits

1. **I+D Manager of the Joint Research Unit (JRU)** created between the CBGP-UPM/INIA-CSIC and the company Tradecorp (currently Rovensa Next). March 2022-December 2022. Total budget **183.000 €**, 61.000 €/year.

C.5. Others

C.5.1. Supervision of PhD students.

1. MSc. Marina Martín-Dacal, the expected defense date is 2024/09/19. Polytechnic University of Madrid (UPM). PhD co-supervisor.
2. Ph.D. Yuechen Bai, 2019/09/04. University of Gent, Belgium. PhD co-supervisor. Currently, Dr. Bai is a PI at Fendu University in Shanghai, China.

C.5.2. Evaluation and reviewing.

- PhD jury member: Dr. Jonas Goossens (UGent, 2017), Dr. Jan Mertens (UGent, 2017), Dra. Carolina González de Figueras (UCM, 2020), MsC. Carmen Vega (University of Vigo, 22/02/2024).
- Evaluator at Applied Biological, Environmental & Earth Sciences Panel. Research Foundation Flanders (FWO). March 2022 (11th and 16th).
- Reviewer of important journals in the field: Plant Journal, Plant Physiology, Journal of Experimental Botany, etc.

C.5.3. Membership.

- SEBBM, Sociedad Española de Bioquímica y Biología Molecular, from March 2012.
- AMIT, Asociación de Mujeres Investigadora y Tecnólogas, from November 2019.
- DivulgaAcción, from March 2024.

C.5.4. Seminars to non-specialized audiences:

- Seminar in the Spanish Embassy in Sweden, invited by ACES, November 2021.