



CURRICULUM VITAE (CVA)

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Part A. PERSONAL INFORMATION

CV date 05/01/2022

First name	Manuel		
Family name	González Guerrero		
Gender (*)	Male	Birth date (dd/mm/yyyy)	XX/XX/1977
ID number			
e-mail:	manuel.gonzalez@upm.es	URL Web	www.metalsym.com
Open Researcher and Contributor ID (ORCID) (*)	0000-0001-7334-5286		

(*) Mandatory

A.1. Current position

Position	Profesor Titular (Associate Professor)/Group Leader		
Initial date	01/02/2021		
Institution	Universidad Politécnica de Madrid		
Department/Center	Centro de Biotecnología y Genómica de Plantas (UPM-INIA/CSIC)		
Country	Spain	Teleph. number	91-067-9190
Key words	Plant nutrition, iron, nitrogen fixation, Medicago truncatula, metal homeostasis, nodules		

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

Period	Position/Institution/Country/Interruption cause
2014-2021	Profesor Contratado-Doctor (Assistant Professor)/Group Leader. Universidad Politécnica de Madrid
2011-2014	Ramón y Cajal Fellow. Universidad Politécnica de Madrid
2010-2011	Marie Curie Fellow IEF. CNRS, France.
2006-2009	Postdoctoral Fellow. Worcester Polytechnic Institute, USA.
2006	Postdoctoral Fellow. University of Guelph, Canada.
2001-2005	FPU fellow. CSIC.

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
PhD in Biochemistry	Universidad de Granada, Spain	2005
Graduate in Biochemistry	Universidad de Granada, Spain	2000

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

My research has always been focused on the mechanisms of transition metal transport and homeostasis, typically in plants or in plant-associated microorganisms. This began with a FPU-funded PhD (2001-2005) at Dr. Concepción Azcón's lab in Estación Experimental del Zaidín (CSIC) in Granada. There, I worked on the molecular bases of arbuscular mycorrhizal fungi tolerance to metals. Major results were the characterization of the first zinc and copper transporters identified in these organisms, the connection with oxidative stress protection, and the discovery of the first ammonium transporter in these fungi. To continue my training, I undertook three postdoctoral positions in labs specialized in different techniques. In 2006, I joined Dr. Larry Peterson's group at University of Guelph (Canada) to be trained on microscopy approaches and metal imaging, which I used to describe the metal accumulation pattern in arbuscular mycorrhizal fungi using EDXS methods coupled to electron microscopy. Then, I



was recruited by Dr. José M. Argüello's team at Worcester Polytechnic Institute (USA) (2006-2009). In his lab, I learnt protein purification and biochemistry of metal transport. Major results were the i) precise description of the metal exchange between metallochaperones and metal-transporting ATPases, ii) the characterization for the first time of the transmembrane metal binding site in a transporter, and iii) the identification of specialized subsets of Cu⁺-ATPases in bacteria. After being awarded a Marie Curie Intra-European Fellowship (2010-2011), I returned to Europe, to Dr. Cathy Curie's group at the Institute for Plant Molecular Biology and Biochemistry (CNRS-INRA-SupAgro, France). There I learned the molecular bases of plant metal homeostasis. Soon after, I received a Ramón y Cajal Fellowship, being hosted at Dr. Juan Imperial's group in Centro de Biotecnología y Genómica de Plantas (CBGP, UPM-INIA/CSIC). Starting in 2011, I initiated by own independent research line on Metal Homeostasis in Plant Microbe Interactions, what has led to my promotion to Profesor Contratado-Doctor UPM (2013), CBGP Group Leader (2014), and Profesor Titular UPM (2021). In this period, we have primarily focused on legume-rhizobia interactions, with major findings being: i) the determination of the metal delivery pathway to nitrogen-fixing cells in nodules, ii) the discovery of the transporters facilitating metal transfer from the host plant to the endosymbiotic rhizobia, iii) the identification of the transporter mediating the signalling of the nutritional status of nodules, and iv) the characterization of the first nodule-specific copper-chaperone. Our lab has recently broadened its scope to return to mycorrhiza research, identifying the first mycorrhiza-specific metal transporter, and plant-pathogen interaction, showing the role of zinc transporters HMA2 and HMA4 in Arabidopsis tolerance to plant pathogens. Three of my publications (González-Guerrero & Argüello, 2018, Tejada-Jiménez et al., 2017, and Gil-Diez et al., 2018) have been highlighted in Faculty 1000/Faculty Opinions. Since returning to Spain I have received funds from intramural, regional, national, European, and private sources, including a ERC Starting grant, and a Bill & Melinda Gates Foundation subgrant. In this period, I have supervised 6 PhD thesis (2 ongoing), 11 postdocs (5 on-going), 4 lab technicians (2 on-going) and 7 undergraduate-Master students.

These scientific contributions have led to two awards: the Arturo Leone Young Investigator Award to Best Researcher in the field of copper research (2010), and the Antonio J. Palomares Award to Best Young Researcher on Nitrogen Fixation (2017). I am as well "Garante" of the Severo Ochoa Seal of Excellence awarded to CBGP (2022-2025), and Managing Committee member and Workgroup Leader of COST Action PLANTMETALS (2021-2024).

Together with these research activities, I regularly review manuscript for top tiered journals in the area (Nature, Science Advances, Plant Cell, New Phytol, Plant Physiol....), and research grants (Agencia Estatal de Investigación, ERC, ANR, Austrian funding Agency, ...). In 2014 I became Associate Editor at Frontiers in Plant Science. I have also participated in evaluation panels, such as for the Ramón y Cajal fellowships (2019), and the Andalusian R&D PAIDI plan (2021). In 2021, I also participated in a Focus Group of EU project CropBooster-P to define the EU priorities to improve plant micronutrient uptake and use efficiency. In addition, since 2013, I have been responsible for teaching at different UPM Grade programmes, primarily the course on "Metabolism and its Regulation" at the Grade in Biotechnology. In the 2017-2019 period, I was the coordinator of the Master on Biotechnology in Agroforestry.

Part C. RELEVANT MERITS

C.1. Publications (ten most relevant publications in the last 10 years)

1. Escudero V, ...[7 authors] **González-Guerrero M***, Jordá L* (2022). *Arabidopsis thaliana* Zn²⁺-efflux ATPases HMA2 and HMA4 are required for resistance to the necrotrophic fungus *Plectosphaerella cucumerina* BMM. *J. Exp. Bot.* 73: 339-350. *Co-corresponding authors
1. Castro-Rodríguez R, Escudero V, Reguera M, ..[11 authors]... **González-Guerrero M** (2021). *Medicago truncatula* Yellow Stripe-Like7 encodes a peptide transporter required for symbiotic nitrogen fixation. *Plant Cell Environ.* 44: 1908-1920
2. Castro-Rodríguez R, Abreu I, Reguera M, ...[10 authors]... J, **González-Guerrero M** (2020). *Medicago truncatula* Yellow Stripe1-Like3 gene is involved in vascular delivery of transition metals to root nodules. *J. Exp. Bot.* 71: 7257-7269.



3. Escudero V, Abreu I, Tejada-Jiménez M, ...[13 authors]... **González-Guerrero M** (2020). *Medicago truncatula* Ferroportin2 mediates iron import into nodule symbiosomes. *New Phytol.* 228:194-209
4. Escudero V, Abreu I, del Sastre E, ...[14 authors]...**González-Guerrero M** (2020). Nicotianamine synthase2 is required for symbiotic nitrogen fixation in *Medicago truncatula* nodules. *Front. Plant Sci.* 10:1780.
5. Gil-Díez P, Tejada-Jiménez M, León-Mediavilla J, Wen J, Mysore KS, Imperial J, **González-Guerrero M** (2019). MtMOT1.2 is responsible for molybdate supply to *Medicago truncatula* nodules. *Plant Cell Environ.* 42: 310-320.
7. Senovilla M, Castro-Rodríguez R, Abreu I, Escudero V, Kryvoruchko I, Udvardi MK, Imperial J, **González-Guerrero M** (2018). *Medicago truncatula* copper transporter1 (MtCOPT1) delivers copper for symbiotic nitrogen fixation. *New Phytol.* **218**: 696-709.
8. Tejada-Jiménez M, Gil-Díez P, León-Mediavilla J, Wen J, Mysore KS, Imperial J, **González-Guerrero M** (2017). *Medicago truncatula* Molybdate Transporter type1 (MtMOT1.3) is a plasma membrane molybdenum transporter required for nitrogenase activity in root nodules under molybdenum deficiency. *New Phytol.* 216:1223-1235.
9. Abreu I, Sáez A, Castro-Rodríguez R, ...[7 authors]... **González-Guerrero M** (2017). *Medicago truncatula* Zinc-Iron Permease6 provided zinc to rhizobia-infected nodule cells. *Plant Cell Environ.* 40:2706-2719.
10. Tejada-Jiménez M, Castro-Rodríguez R, Kryvoruchko IS, Lucas MM, Udvardi M, Imperial J, **González-Guerrero M** (2015). *Medicago truncatula* Natural Resistance Associated Macrophage Protein1 is required for iron uptake by rhizobia-infected nodule cells. *Plant Physiol.* 168:258-275.

C.2. Congress (only oral and invited presentations are indicated)

1. Escudero V, Castillo-Michel H, Imperial J, **González-Guerrero M** (2021). *Medicago truncatula* Ferroportin2 mediates iron import into nodule symbiosomes. COST Action PLANTMETALS Meeting. Ceske Budejovice, Czech Republic.
2. Abreu I, Castro-Rodríguez, Küpper H, Imperial J, **González-Guerrero M** (2019). How do metals reach the *Medicago truncatula* nodule? Characterization of MtYSL8, a potential metal-nicotianamine transporter. VI Portuguese-Spanish Congress on Nitrogen Fixation. Madrid, Spain.
3. Gil-Díez P, Tejada-Jiménez M, León-Mediavilla J, Imperial J, **González-Guerrero M** (2018). Molybdenum transport to *Medicago truncatula* nodules is mediated by MtMOT1.2 and MtMOT13. 13th European Nitrogen Fixation Conference. Stockholm, Sweden.
4. **González-Guerrero M** (2017). Metallating the nodule: Transition metal transport in symbiotic nitrogen fixation. 3rd Iberoamerican Conference of Beneficial Plant-Microorganism-Environment Interactions. Lima, Peru.
5. Senovilla M, Castro-Rodríguez R, Abreu I, [4 authors], **González-Guerrero M** (2017). *Medicago truncatula* copper transporter1 (MtCOPT1) delivers copper for symbiotic nitrogen fixation. 20th International Congress on Nitrogen Fixation. Granada, Spain.
6. Tejada-Jiménez M, Saez A, Senovilla M, [7 authors], **González-Guerrero M** (2016). MtNramp1, MtZIP6, and MtCOPT1 are respectively responsible for iron, zinc, and copper uptake by *Medicago truncatula* nodule cells. 12th European Nitrogen Fixation Conference. Budapest, Hungary.
7. Tejada-Jiménez M, Castro-Rodríguez R, Kryvoruchko I, Lucas MM, Udvardi M, Imperial J, **González-Guerrero M** (2016). MtNramp1 is responsible for iron uptake by rhizobia infected cells in *Medicago truncatula* nodules. 18th International Symposium on Iron Nutrition and Interaction in Plants. Madrid, Spain.
8. Senovilla M, Castro-Rodríguez R, Imperial J, **González-Guerrero M** (2015). MtCOPT1 mediates copper transport to *Medicago truncatula* nodules. XV Reunión de la Sociedad Española de Fijación de Nitrógeno. León, Spain.
9. Tejada-Jiménez M, Castro-Rodríguez R, Kryvoruchko I, Lucas MM, Udvardi M, Imperial J, **González-Guerrero M** (2016). MtNramp1 is responsible for iron uptake by rhizobia infected cells in *Medicago truncatula* nodules. XXI Reunión de la Sociedad Española de Fisiología Vegetal. Toledo, Spain.
10. **González-Guerrero M** (2014). Metal transport in the legume-rhizobia interface. FASEB Summer Conference on Trace Elements in Biology and Medicine. Steamboat Springs, USA.



11. Senovilla M, Kryvoruchko I, Finney L, Udvardi M, Imperial J, **González-Guerrero M** (2014). MtMTP2 is involved in metal homeostasis in *Medicago truncatula* nodules. 11th European Nitrogen Fixation Conference. Adeje, Spain.

C.3. Research projects

1. Plan de Empleo Juvenil CAM (PEJ2020-TL/BIO-18547). 2021-2023. PI: **Manuel González-Guerrero**.
2. BNF Cereals Phase III. 2020-2024. Bill and Melinda Gates Foundation (INV-005889). PI Luis Rubio
3. Role of plant Cu⁺-chaperones in intracellular copper trafficking in symbiotic nitrogen fixation. 2019-2021. Ministerio de Ciencia, Innovación, y Universidades. PGC2018-095996-B. PI **Manuel González-Guerrero**.
4. The role of Copper in Plant Innate Immunity. 2019-2020. CBGP Severo Ochoa-funded grants. PI: Lucía Jordá (**Manuel González-Guerrero** Co-PI).
5. Understanding the molecular bases of zinc-mediated immunity in plant innate response. 2019. Swiss Lightsource grant 20190682. PI: **Manuel González-Guerrero**. 17
6. Precision Targeting of Metals. 2018-2021. CBGP Severo Ochoa-funded grants. PI: **Manuel González-Guerrero**.
7. Role of copper in plant innate immunity. 2018. Swiss Lightsource grant 20180921. PI: **Manuel González-Guerrero**.
8. Iron homeostasis in *Medicago truncatula*. 2017. European Synchrotron Radiation Facility grant EV-323. PI: **Manuel González-Guerrero**.
9. Diverting metals to *Medicago truncatula* nodules. 2016-2018. Plan Nacional MINECO (AGL-2015-65866-P). PI: **Manuel González-Guerrero**.
10. Zinc homeostasis in *Medicago truncatula* nodules. 2016. Swiss Lightsource grant 2016330. PI: **Manuel González-Guerrero**.
11. Iron homeostasis in *Medicago truncatula* nodules. 2016. European Synchrotron Radiation Facility grant EV-246. PI: **Manuel González-Guerrero**.
12. Metal homeostasis in the tripartite symbioses arbuscular mycorrhizal fungi-legume-rhizobia. 2014-2019. European Research Council Starting Grant (ERC-StG-2013-335284-METALSYM). PI: **Manuel González-Guerrero**.
13. Transporte de metales al nódulo de *Medicago truncatula*. 2013-2015. Plan Nacional MINECO (AGL-2012-32974). PI: **Manuel González-Guerrero**.
14. Metal transport into *Medicago truncatula* nodules. 2012. Argonne National Lab grant 26208. PI: **Manuel González-Guerrero**.
15. Metal homeostasis into *Medicago truncatula* nodules. 2011-2015. Marie Curie International Reintegration grants (IRG-2010-276771-MENOMED). PI: **Manuel González-Guerrero**.

C.4. Contracts, technological or transfer merits

1. The sugarcane microbiome: A key element in sustainability in an energy crop. Repsol S.A. IP: Juan Imperial. 262,000€.