

**Part A. PERSONAL INFORMATION**

**CV date**

14-01-2022

First and Family name	María del Carmen del Campillo		
Social Security, Passport, ID number			
Researcher codes	Open Researcher and Contributor ID (ORCID**)	0000-0001-5098-2290	
	SCOPUS Author ID (*)	6602538511	
	WoS Researcher ID (*)	C-3606-2015	

(\*) Optional

(\*\*) Mandatory

**A.1. Current position**

Name of University/Institution	University of Cordoba		
Department	Agronomy		
Address and Country	Edificio C4, Campus de Rabanales, 14071 Córdoba		
Phone number	+34 606436410	E-mail:	<a href="mailto:campi@uco.es">campi@uco.es</a>
Current position	Full Professor	From	2016
Key words	Soil Fertility, Phosphate, Iron, Zinc, Calcareous Soils, Soil Health		

**A.2. Education**

PhD, Licensed, Graduate	University	Year
Agricultural Engineer	Polytechnic University of Madrid	1987
Ph.D. Agricultural Engineer	University of Cordoba	1992

**A.3. General indicators of quality of scientific production (see instructions)**

- Normalized impact factor: 1.99 (>1, which is the mean)
- H-index (Web of Science): 20
- Manuscripts in JCR journals: 60, Q1: 35 (86%). Citations>1200; Manuscripts published last 10 years 40, and last 5 years 20. Outreach journals 22.
- Projects: 17 funded research projects, 9 of which was the Principal Investigator. Thesis supervised: 5.
- Co-inventor of 3 Patents, related to the design of new slow-release fertilizers.
- The Department of Agronomy have received "*Unit of Excellence Maria de Maeztu*" Award (2020-2024) and I belong to the Steering Committee as a guarantor ("garante").

**B. CV SUMMARY (max. 3500 characters, including spaces)**

The first years of my research were focused on Soil Evaluation for a proper agricultural use which allowed me to work with researchers J. Torrent and V. Barrón at the University of Córdoba. Next, I carried out my Doctoral Thesis on soils of Mediterranean areas focused on the study of reactive surfaces, mainly carbonates and iron (Fe) oxides in order to address the problem of Fe deficiency -ferric chlorosis- of crops that are the key in our country as olive, vine, peach, pear and legumes. This allowed me to define the most important soil properties and to define the adequate methodology to be used in the laboratory to assess this soil problem.

Once the problem of Fe chlorosis in soil was understood, a new idea arose: the development of more sustainable strategies to prevent and correct Fe chlorosis in calcareous soil, without losing sight of it, which would be an economically viable solution for farmers, especially from extensive crops. After years of research, the efficacy and persistence in field (3-5 years) of a ferrous phosphate (vivianite) and a ferrous carbonate (siderite) was demonstrated in crops such as pear, olive, vine, kiwi, strawberry and chickpea. The result of this work could be summarized in the publication of 23 SCI articles, 3 patents and 14 publications of national scope, and dissemination for technicians of the field and farmers. Currently, vivianite is a fertilizer recommended by the Manual of Good Agricultural Practices in the Olive Grove.



One of the most concerning problems in soil fertility agriculture is the management of phosphate (P) fertility. I also worked in P geodynamic in soil, and specifically, in the development of P desorption models to understand the environmental problems in soils with leading international researchers such as Drs. van Riemsdijk and van der Zee (NL) during my postdoctoral period. Subsequently, I approached different research with calcareous soils to evaluate P losses due to erosion, and to understand and improve the prediction of P bioavailability in soil through tests for plants and the dynamics of this element in Mediterranean soils. As a result of this work, 18 SCI articles were published. As a consequence of both lines of research, the curiosity arises to explore the effects of P fertilization in soils at risk of inducing micronutrient deficiencies (Fe chlorosis and Zn deficiency). Five SCI articles have been published so far in which is shown that P fertilization aggravate Fe chlorosis and Zn deficiency but it depends on the content of P and Fe oxides in the soil. In addition, I collaborate with the 'Sociedad Agrícola de Córdoba', which manages around 30,000 ha of extensive crops to advise and manage P fertilization. Our research group develops multiple experiments to assess the proper dose and management of P fertilization, two of these fields started in 2010.

My current research is motivated by a more sustainable use of the resource soil and, specifically, I am motivated by the search of knowledge about soil fertility that can provide farmers with tools to maintain an adequate level of nutrients in the soil, healthy agroecosystems and improved biodiversity. This research involves the use of entomopathogenic fungi not only to control pests but also to enhance soil fertility and promote plant growth. It is necessary to find solutions in soil management so that agriculture can ensure sufficient food production with full food security and respect for the environment.

## **Part C. RELEVANT MERITS** (sorted by typology)

### **C.1. Publications** (see instructions). Selection of 10 in the last 5 years.

1. Sánchez-Rodríguez AR, M Marín-Paredes, A González-Guzmán, J.M. Méndez, M. Sánchez-Parra, D. Sacristán, M. Fuentes-García, V. Barrón, J. Torrent, M.C. del Campillo. 2021. Zinc biofortification strategies for wheat grown on calcareous Vertisols in southern Spain: application method and rate. Plant and Soil. <https://doi.org/10.1007/s11104-021-04863-7> (Q1).
2. González-Guzmán A, S. Raya-Díaz, D. Sacristán, M. Yousef, A.R. Sánchez-Rodríguez, V. Barrón, M.C. del Campillo, J. Torrent. 2021. Effects of entomopathogenic fungi on durum wheat nutrition and growth in the field. European Journal of Agronomy 128 (2021) 126282. doi.org/10.1016/j.eja.2021.126282 (Q1).
3. Sánchez-Rodríguez AR, Rey MD, Nechate-Drif H, Castillejo MA, Jorrín-Novo J, Torrent J, del Campillo MC, Sacristán D. 2021. Combining P and Zn fertilization to enhance yield and grain quality in maize grown on Mediterranean soils. Scientific Reports. 10.1038/s41598-021-86766-2 (Q1)
4. Sacristán D, González-Guzmán A, Torrent J, del Campillo MC. 2020. Optimum Olsen Phosphorus/ DTPA-Zinc ratio for the initial growth of maize in agricultural soils of the Mediterranean Region. Journal of Science and Food of Agriculture. DOI:10.1002/jsfa.10940. (Q1).
5. González-Guzmán A, Sacristán D, Quesada-Moraga E, Torrent J, del Campillo MC, Sánchez-Rodríguez AR. 2020. Effects of entomopathogenic fungi on growth and nutrition in wheat grown on two calcareous soils: Influence of the fungus application method. Annals of Applied Biology. 10.1111/aab.12596. (Q1).
6. González-Guzmán A, Sacristán D, Sánchez-Rodríguez AR, Barrón V, Torrent J, del Campillo MC. 2020. Soil nutrients effects on the performance of durum wheat Inoculated with entomopathogenic fungi. Agronomy.10.3390/agronomy10040589. (Q1).
7. Barrón V, Méndez JM, Balbuena J, Cruz-Yusta M, Sánchez L, Giménez C, Sacristán D, González-Guzmán A, Sánchez-Rodríguez AR, Skiba U, Inda AV, Marques JJr, Recio JM, Delgado A, del Campillo MC and Torrent J. 2020. Photochemical emission and fixation of

NO<sub>x</sub> gases in soils. The Science of the Total Environment  
DOI:10.1016/j.scitotenv.2019.134982. (Q1).

8. Sacristán D, González-Guzmán A, Barrón V, Torrent J, del Campillo MC. 2019. *Phosphorus*-induced zinc deficiency in wheat pot-grown on noncalcareous and calcareous soils of different properties. Archives of Agronomy and Soil Science. DOI: 10.1080/03650340.2018.1492714. (Q1).
9. Sánchez-Rodríguez AR, Raya-Díaz S, Zamarreño AM, García-Mina JM, del Campillo MC, Quesada-Moraga E. 2018. An endophytic *Beauveria bassiana* strain increases spike production in bread and durum wheat plants and effectively controls cotton leafworm (*Spodoptera littoralis*). Biological Control 116, 90-102. (Q1).
10. Sánchez-Rodríguez AR, del Campillo MC, Torrent J. 2017. *Phosphorus* reduces the zinc concentration in cereals pot-grown on calcareous Vertisols from southern Spain. Journal Science of Food Agriculture. 97: 3427-3432. (Q1)

## C.2. Research projects

1. Title: Fertilidad fosfatada y funciones del suelo en respuesta a la aplicación de fuentes alóctonas de fósforo. Reference: [PID2020-118503RB-C22](#)  
Funding Institution: Ministerio de Economía, Industria y Competitividad. 2020-2023.  
Budget: € 169,000.  
Principal Investigator: María del Carmen del Campillo y Antonio R. Sánchez-Rodríguez
2. Title: Reacciones abióticas de fotocatalisis: una entrada inexplorada de nitrógeno en suelos agrícolas (AbioNSoil); Reference: P18-RT-3086;  
Funding Institution: Junta de Andalucía, Consejería de Conocimiento Investigación y Universidad. 2020-2023.  
Budget: € 107,000.  
Principal Investigator: Antonio R. Sánchez-Rodríguez
3. Title: Efecto de los cambios ambientales en la interacción del nitrógeno y fósforo con las superficies reactivas del suelo.  
Funding Institution: Ministerio de Economía, Industria y Competitividad. 2018-2021  
Budget: € 83,000  
Principal Investigator: María del Carmen del Campillo y Vidal Barrón
4. Title: Factores edáficos que afectan a la fitodisponibilidad del cinc en relación con el estatus del fósforo del suelo  
Funding Institution: Ministerio de Ciencia e Innovación. 2015-2017  
Budget: € 150,000  
Principal Investigator: María del Carmen del Campillo
5. Title: Biogeoquímica del fósforo en el suelo: optimización de criterios para un uso agronómico eficiente y ambientalmente aceptable de un recurso renovable  
Funding Institution: Junta de Andalucía. 2011-2014  
Budget: € 208,000  
Principal Investigator: Antonio Delgado, US
6. Title: Relación entre el valor de un test de fósforo del suelo y el fosfato en disolución: exploración de un nuevo formalismo. AGL2011-29893-C02-02  
Funding Institution: Ministerio de Ciencia e Innovación. 2011-2014  
Budget: € 100,000  
Principal Investigator: María del Carmen del Campillo
7. Title: Sustainable strategies for pest control based on the establishment of rhizosphere-competent and endophytic Entomopathogenic Fungi  
Funding Institution: Consejería de Economía, Innovación, Ciencia y Empleo. Junta de Andalucía. P11-AGR-7681. 2011-2015  
Budget: € 308000  
Principal Investigator: Enrique Quesada Moraga

## C.3. Contracts, technological or transfer merits

1. Diffuse *phosphorus* input to surface waters - new concepts in removal, recycling and management (P-TRAP). H2020-MSCA-ITN-ETN. Project No 818309. Coordinator at the University of Seville Antonio Delgado. MC del Campillo: member of the research group in the University of Seville Budget € 251000. 1/03/2019-28/02/2023. Main objective: develop

new methods to *trap P* in drained agricultural areas and in the sediments to design new fertilizers.

2. Optimising bio-based fertilizers in agriculture (LEX4BIO). Project No 818309. H2020-RUR-2018-2. Budget € 349720. 1/07/2019-30/06/2023. Coordinator in U. Seville Antonio Delgado). MC del Campillo: Member Subcontracted from the research group of the University of Seville. Main objective: Minimize the environmental impact of existing fertilizers and improving sustainability through recycling of nutrient-rich side-streams.
3. LAND Management: Assessment, Research, Knowledge base (LANDMARK); Reference: H2020-635201. European Commission, Horizon 2020 (H2020-SFS).Leader Research in Spain: Antonio Delgado. 01/05/2015-30/09/2019. Budget: € 16840. In UCO Leader Researcher: María del Carmen del Campillo.
4. Corrección de la clorosis férrica del olivar con NPK enriquecido en hierro”. Leader Researcher: Vidal Barrón. Company: FERTIBERIA. 06/2014-12/2015.Budget:€ 35000

#### C.4. Patents

1. Title: Método para corregir y prevenir la clorosis férrica en planta: caracterizado por aplicar una suspensión de siderita sintética al suelo. Number of patent: 2 343 160. Date: 8/07/2010  
Inventors: del Campillo MC, Sánchez-Alcalá I, Barrón V, Torrent J, Delgado  
Country: Spain. Patent Holder: Universidad de Córdoba y Universidad de Sevilla
2. Title: La mezcla de compost con vivianita hace más efectiva esta última para prevenir la clorosis férrica.  
Inventors: Delgado A, Carmona E, de Santiago A, Quintero JM, del Campillo MC, Barrón V, Torrent J. Number of patent: P200702426. Date: 09/11/2007  
Country: Spain. Patent Holder: Universidad de Sevilla y Universidad de Córdoba
3. Title: Método de corrección de la clorosis férrica en plantas: caracterizado la aplicación de una mezcla de sales de hierro y sustancias húmicas (ácidos húmicos y fúlvicos).  
Inventors: Delgado A, de Santiago A, del Campillo MC, Kasem S, Torrent J, Barrón V, Andreu L. Number of patent: 2 245 253. Date: 16/09/2006  
Country: Spain. Patent Holder: Universidad de Sevilla y Universidad de Córdoba

#### C.5. Awards received

1. *Fertiberia* Award 2015 for the best *Doctoral Thesis* 18th call for doctoral candidate J.C. Cañasveras under the direction of María del Carmen del Campillo and Vidal Barrón. The prize was endowed with 24000€. Title of the thesis: New techniques of prediction and correction of ferric chlorosis in calcareous soils: diffuse reflation, salts of iron and covered with grasses.
2. Award from the *Official College of Agricultural Engineers* of Andalusia 2015 for the best *Doctoral Thesis* to Antonio Rafael Sánchez-Rodríguez under the direction of María del Carmen del Campillo and José Torrent. The prize was endowed with 2000 €. Title of the Thesis: Influence of *phosphate* fertilization in ferric chlorosis.
3. Award from the *Spanish Society of Soil Science* (SECS) in 2014 for the best *Doctoral Thesis* to the candidate A.R. Sánchez-Rodríguez under the direction of María del Carmen del Campillo and José Torrent. The prize was endowed with 2000 €. Title of the thesis: Influence of *phosphate* fertilization in ferric chlorosis.
4. Award from the *Official College of Agricultural Engineers* of Andalusia in 2013 for the best *Doctoral Thesis* to I. Sánchez-Alcalá under the direction of María del Carmen del Campillo and José Torrent. The prize was endowed with 1800 €. Title of the thesis: Bioavailability of iron in calcareous soils: microbial reduction and application of nanofertilizers.