

**CURRICULUM VITAE ABREVIADO (CVA)**

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

**Part A. PERSONAL INFORMATION**

First name	Rafael		
Family name	Clemente Carrillo		
Gender (*)	Male	Birth date (dd/mm/yyyy)	14/11/1975
Social Security, Passport, ID number	ID number: 23004093E		
e-mail	<a href="mailto:rclemente@cebas.csic.es">rclemente@cebas.csic.es</a>	URL Web	<a href="https://www.researchgate.net/profile/Rafael-Clemente-2">https://www.researchgate.net/profile/Rafael-Clemente-2</a>
Open Researcher and Contributor ID (ORCID) (*)	0000-0003-0085-1764		

(\*) Mandatory

**A.1. Current position**

Position	Staff Scientist ( <b>Científico Titular</b> )		
Initial date	27/04/2021		
Institution	Consejo Superior de Investigaciones Científicas ( <b>CSIC</b> )		
Department/Center	Conservación de Suelos y Agua y Manejo de Residuos Orgánicos/ Centro de Edafología y Biología Aplicada del Segura ( <b>CEBAS</b> )		
Country	Spain	Teleph. number	+34 968396200 (Ext. 445385)
Key words	Soil remediation; Soil quality; Contaminated soils; Heavy metals; Arsenic; Phytoremediation; Organic amendments; Waste revalorization; Pore water; Ecotoxicity; Natural attenuation; Bioenergetic crops		

**A.2. Previous positions (research activity interruptions, indicate total months)**

Period	Position/Institution/Country/Interruption cause
1998-1999	Research grant/U. of Murcia/Spain
2000-2004	PhD Student/CEBAS-CSIC/Spain
2004-2005	Research contract/CEBAS-CSIC/Spain
2006-2008	Post-doctoral fellow/Liverpool John Moores Uni./UK
2008-2009	Post-doctoral researcher (JAE-Doc)/CEBAS-CSIC/Spain
2009-2016	Post-doctoral researcher (Ramón y Cajal)/CEBAS-CSIC/Spain
2016-2021	Staff researcher (Inv. Distinguido OPI)/CEBAS-CSIC/Spain

**A.3. Education**

PhD, Licensed, Graduate	University/Country	Year
<b>B.Sc. in Chemistry</b> (Licensed)	University of Murcia	<b>1998</b>
Honours Project	University of Murcia	1999
Higher Degree - English	State Language School (EOI Murcia)	2002
<b>Doctoral Thesis</b> (PhD)	University of Murcia	<b>2004</b>
Certificate of Proficiency in English	Cambridge U. (exam center U. of Murcia)	2008

(Include all the necessary rows)

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

Since I started my career I have been working on the biogeochemistry of trace elements in the soil and on how the use of organic amendments influence it, particularly during soil



(phyto)remediation processes. During my PhD period at CEBAS-CSIC, I published a number of articles that reported the results of soil incubations with different materials, sequential extractions of trace elements in the soils, and pot and field experiments using different organic materials for the stabilization of the contaminants and to facilitate the growth of the plants in the soil. At that moment, phytoremediation processes were being widely studied and developed at an international level, and my results received wide attention (published in high rank journals and highly cited). Once I had finished my PhD I moved to the UK (John Moores University, Liverpool), where I had the chance to study differently contaminated soils, focusing on arsenic (As) contamination and setting up a system for 'in situ' pore water (soil solution) collection that had not been used for environmental studies before. The results of these studies resulted of great novelty and relevance, and received again wide international attention. After that, I got different post-doctoral contracts (JAE-Doc and Ramón y Cajal) in CEBAS-CSIC that allowed me to continue my research, focusing on the implementation of phytoremediation techniques through a set of laboratory, greenhouse and field experiments that incorporated the use of new waste materials, native or locally adapted plant species, pore water sampling and analysis, valorization of the biomass generated during phytoremediation processes, its possibilities of (bio)energetic transformation and, finally its contribution to zero waste and circular economy policies. I finally got a permanent position (Staff Scientist) at CEBAS-CSIC, first as 'Investigador Distinguido' (2016) and then as 'Científico Titular' (2021). The options for the transformation, reutilization and recycling of different waste materials has always been a concomitant research line throughout my career, this being a research line that has received wide funding in my research group, particularly from different EU-funded calls and programs. All this experience allowed me to participate in multiple international conferences, being recently the keynote speaker in international conferences (15th ICOBTE, China, 2019), online workshops (HaloFarms-PRIMA, 2020) and courses (Biodiversity and bioindicators in monitoring and management of contaminated soils, Italy, 2019). This experience has also let me to be part of the editorial board of different international journals (Toxics (mdpi), Applied and Environmental Soil Science (Hindawi), Heliyon (Cell Press), Frontiers in Soil Science (Frontiers), Soil (EGU/Copernicus), Soil & Environmental Health (Elsevier)) and to participate in the international committee of different conferences (ICOBTE, RAMIRAN). I have also collaborated with private enterprises, that have shown their explicit interest in the research projects and different proposals submitted, which resulted in two research contracts with the companies SINERGIAS SL and AUDECA SLU (Elecnor), worth ca. 30.000 €. I participated also in the registration of a Utility Model (ES1217738 U) consisting on a device for soil revegetation. I have been, so far, the Principal Investigator of four nationally funded projects and two regional ones (>500,000 €). My research has helped to establish the Phytoremediation Team (PhytoRec) within the Sust. Soil-Plant System group, where I have supervised six Doctoral Thesis, and different final Master's Thesis (5) and Grade Projects (2), and received international pre- and post-doctoral researchers to carry out their investigations under my supervision. Frequent reviewer for more than 20 international journals and evaluator of project proposals for the Spanish national research agency (AEI) and for those of different countries abroad (Belgium, Ireland, Czech Republic, Kazakhstan, Poland and Austria). Author of 63 SCI articles (total cites 4641, h-index 32; SCOPUS). Head of the Department of Soil and Water Conservation and Organic Waste Management of CEBAS-CSIC since March 2021.

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

### **C.1. Publications** (see instructions)

- (1) Álvarez-Robles, M.J., Bernal, M.P., De Brasi-Velasco, S., Sevilla, F., **Clemente, R. 2022.** Response of *Phragmites australis* to increasing As(V) concentrations: Accumulation and speciation of As, and plant oxidative stress. *Chemosphere* 302, 134937.
- (2) Álvarez-Robles, M.J., Bernal, M.P., **Clemente, R. 2022.** Differential response of *Oryza sativa* L. and *Phragmites australis* L. plants in trace elements contaminated soils under flooded and unflooded conditions. *Environmental Geochemistry and Health* 44, 99–115.



- (3) Bernal, M.P., Grippi, D., **Clemente, R.** 2021. Potential of the biomass of plants grown in trace element-contaminated soils under Mediterranean climatic conditions for bioenergy production. *Agronomy* 11, 1750.
- (4) Visconti, D., Álvarez-Robles, M.J., Fiorentino, N., Fagnano, M., **Clemente, R.** 2020. Use of *Brassica juncea* and *Dactylis glomerata* for the phytostabilization of mine soils amended with compost or biochar. *Chemosphere* 260, 127661.
- (5) Hunce, S.Y., **Clemente, R.**, Bernal, M.P. 2019. Energy production potential of phytoremediation plant biomass: *Helianthus annuus* and *Silybum marianum*. *Industrial Crops and Products* 135, 206-216.
- (6) Bernal, M.P., Gómez, X., Chang, R., Arco-Lázaro, E., **Clemente, R.** 2019. Strategies for the use of plant biomass obtained in the phytostabilisation of trace-element-contaminated soils. *Biomass and Bioenergy* 126, 220-230.
- (7) **Clemente, R.**, Arco-Lázaro, E., Pardo, T., Martín, I., Sánchez-Guerrero, A., Sevilla, F., Bernal, M.P. 2019. Combination of soil organic and inorganic amendments helps plants overcome trace element induced oxidative stress and allows phytostabilisation. *Chemosphere* 223, 223-231.
- (8) Pardo, T., Bernal, M.P., **Clemente, R.** 2017. Phytostabilisation of severely contaminated mine tailings using halophytes and field addition of organic and inorganic amendments. *Chemosphere* 178, 556-564.
- (9) **Clemente, R.**, Pardo, T., Madejón, P., Madejón, E., Bernal, M.P. 2015. Food byproducts as amendments in trace elements contaminated soils. *Food Res. Int.* 73, 176-189.
- (10) **Clemente, R.**, Walker, D.J., Pardo, T., Martínez-Fernández, D., Bernal, M.P. 2012. The use of a halophytic plant species and organic amendments for the remediation of a trace elements-contaminated soil under semi-arid conditions. *J. Hazard. Mat.* 223-224, 63-71.

**C.2. Congress**, indicating the modality of their participation (invited conference, oral presentation, poster)

Authors: **Clemente, R.**, Pardo, T., Arco-Lázaro, E., Álvarez-Robles, M.J., Bernal, M.P.

Title: Phytoremediation of metal contaminated sites using amendments and native plant species: options for biomass use/profitability

Conference: ICOBTE 2019, Nanjing, China. May 5-9 2019.

Type of participation: Oral Keynote conference (R. Clemente)

Authors: Pardo, T., Bernal, M.P., **Clemente, R.**

Title: Application of a red mud derivate in the phytostabilisation of mine tailings: effects on trace elements solubility, speciation and plant accumulation

Conference: 18th International Conference on Heavy Metals in the Environment (ICHMET), Ghent, Belgium. September 12-15 2016

Type of participation: Oral communication (R. Clemente)

Authors: Pardo, T., Bes, C., Bernal, M.P., **Clemente, R.**

Title: Phytomanagement of extremely contaminated mine tailings: combination of amendments and modeling of trace elements solubility and accumulation in plants

Conference: 13th ICOBTE, Fukuoka, Japan. July 12-16 2015.

Type of participation: Oral communication (R. Clemente)

Authors: M.P. Bernal, **R. Clemente**, T. Pardo, D. Martínez-Fernández, D.J. Walker

Title: A successful phytoremediation strategy in a TE polluted mine soil under semi-arid conditions.

Conference: 23rd Annual Meeting of the Society of Environmental Toxicology and Chemistry (SETAC Europe), Glasgow, UK. Mayo 12-16 2013.

Type of participation: Oral communication (R. Clemente)

**C.3. Research projects**, indicating your personal contribution. In the case of young researchers, indicate lines of research for which they have been responsible.

Title: Nuevas tendencias en la fitorrecuperación de suelos contaminados por elementos traza: hacia un modelo de economía circular (RTI2018-100819-B-I00).



Principal Investigator: Dr. M<sup>a</sup> Pilar Bernal Calderón & Dr. **Rafael Clemente Carrillo**

Funding body: Ministerio de Ciencia, Innovación y Universidades. Programa Estatal de I+D+i Orientada a los Retos de la Sociedad 2018.

Duration: 01/01/2019 – 31/12/2022. Grant amount: 173.030 €

Title: Employing circular economy approach for OFMSW management within the Mediterranean countries – CEOMED (A\_B.4.2\_0058).

Principal Investigator: Maria López (IDENER)

Funding body: ENI CBC MED Programme 2018 – European Union.

Duration: 01/06/2019 – 30/06/2022 Grant amount (CEBAS-CSIC): 163.824,51 €

Title: Sostenibilidad de suelos afectados por elementos traza mediante aprovechamiento bioenergético (201740I022).

Principal Investigator: **Rafael Clemente Carrillo**

Funding body: Consejo Superior de Investigaciones Científicas. Ayudas para la incorporación de personal investigador a las escalas científicas del CSIC 2017.

Duration: 01/12/2017 – 30/11/2018 Grant amount: 5.000 €

Title: Especiación de As en suelo, agua de poro y plantas de la Sierra Minera de La Unión: desarrollo de un modelo preliminar de toxicidad para plantas (19460/PI/14).

Principal Investigator: **Rafael Clemente Carrillo**

Funding body: Fundación Séneca. Programa de Apoyo a la Investigación 2014

Duration: 01/07/2015 – 31/12/2018 Grant amount: 45.400 €

Title: Valor añadido del uso de plantas en la inmovilización de elementos traza en el suelo: cultivos bio-energéticos y seguridad alimentaria (CTM2013-48697-C2-1-R)

Principal Investigator: **Rafael Clemente Carrillo** (IP1; Coordinador), M<sup>a</sup> Pilar Bernal (IP2)

Funding body: Ministerio de Economía y Competitividad. Programa Estatal de Investigación, Desarrollo e Innovación Orientada a los Retos de la Sociedad 2013.

Duration: 01/01/2014 – 30/09/2017 Grant amount: 151.250 €

Title: Evaluation of manure management and treatment technology for environmental protection and sustainable livestock farming in Europe (MANEV) (LIFE09 ENV/ES/000453).

Principal Investigator: CEBAS-M<sup>a</sup>Pilar Bernal Calderón (Coordinator: SARGA, Zaragoza).

Funding body: Dirección General de Medio Ambiente de la CE. Programa Life2009

Duration: 01/01/2011 – 31/12/2015 Grant amount (CEBAS-CSIC): 189.547 €

Title: Estudio del efecto de enmiendas del suelo (inorgánicas y orgánicas) en la movilidad y biodisponibilidad de arsénico en suelos contaminados por actividad minera (11785/PI/09)

Principal Investigator: **Rafael Clemente Carrillo**

Funding body: Fundación Séneca. Programa de Apoyo a la Investigación 2009.

Duration: 01/01/2010 – 31/12/2014 Grant amount: 53.161 €

**C.4. Contracts, technological or transfer merits**, Include patents and other industrial or intellectual property activities (contracts, licenses, agreements, etc.) in which you have collaborated. Indicate: a) the order of signature of authors; b) reference; c) title; d) priority countries; e) date; f) Entity and companies that exploit the patent or similar information, if any

Title: Uso de cultivos energéticos en la fito-recuperación de suelos contaminados con contaminantes orgánicos aromáticos (hidrocarburos aromáticos policíclicos o fluidos termosolares). R&D Agreement (27.200 €).

Principal Investigator: **Rafael Clemente Carrillo**

Funding body: **AUDECA S.L.U.**

Duration: 29/03/2016 – 30/09/2018

Title: Uso de pellets y polvos de RedMedit para la depuración de efluentes de plantas desalinizadoras de agua en el campo de Cartagena. R&D Agreement (4.356 €).

Principal Investigator: **Rafael Clemente Carrillo**

Funding body: **SINERGIAS S.L.**

Duration: 01/09/2016 – 31/10/2016

Title: Device for soil revegetation. Utility Model.

Inventors: Bernal Calderón, Pilar, **Clemente Carrillo, Rafael**, Martínez Fernández, Domingo

ID Code: U201831081(X). Date of Registry: 07/12/2018. Registry Model: ES1217738

Holder Entity: Consejo Superior de Investigaciones Científicas (100%)