Sandra Carrasco-Gil

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Experience

Postdoctoral Research **2015-2017**
Universidad Autónoma of Madrid, Spain. Department of Agricultural Chemistry: Crop fortification using special and degradable micronutrient fertilizers. Foliar fertilization. Influence of seaweed extract in plant metabolism.

Postdoctoral Research **2013-2015**
EEAD-CSIC, Saragossa, Spain. Department of Plant Nutrition: Micronutrient deficiencies. Foliar fertilization, Localization and distribution of nutrients by LA-ICP-MS. Analysis of metabolites in apoplastic fluids and fertilizer products by HPLC-MS.

Postdoctoral Research **2011-2012**
Universidad Autónoma de Madrid, Spain. Plant Biology Department. Specific stress responses to cadmium, arsenic and mercury in plants. The role of glutathione in mercury tolerance in plants grown hydroponically.

Predoctoral Research **2006-2010**
Universidad Autónoma de Madrid. Plant Biology Department. CIEMAT, Madrid. Environmental Department. Mercury localization and speciation in plants grown hydroponically or in a natural environment. Identification of metal-complexes involved in metal tolerance. Influence of nitrate fertilization on Hg uptake and oxidative stress parameters in alfalfa plants cultivated in a Hg-polluted soil. Chemical soil characterization.

Predoctoral Research **2005**
Universidad Politécnica de Madrid. Agronomy Department. Influence of fertilizers and organic matter in contaminated soils in relation to metal uptake by plants.

Stages in Research Centers I+D+i

Stanford Synchrotron Radiation Laboratory (SSRL) **2009-2010**
Menlo Park, California, EEUU. Short stages (10 months). Localization and Speciation of nutrients in plant tissue by the following techniques: (SXRF) and (XANES and EXAFS).

California Estate University, East Bay **2009**
Department of Chemistry and Biochemistry, Hayward, California, EEUU. Short stage (6 months). Experimental design and plant material production exposed to heavy metals for speciation analysis.

Education

PhD. Biology **2011**
Universidad Autonoma of Madrid, Spain. (Plant Biology programme: Molecular, Physiology and Biotechnology). Cum laude.

M.S. Agro-Environmental Technology **2005**
Universidad Politecnica de Madrid, Spain. *Cum laude*.

B.S. Environmental Science **2002**
Universidad Europea de Madrid, Spain. Fellowship.

Technical skills

- Photosynthetic pigment analysis and chlorophyll concentration by HPLC and SPAD respectively.
- Photosynthetic activity by fluorescence (FMS-2).
- Identification of metal complexes by HPLC-MS.
- Flame atomic absorption for metal concentration in plant tissue and soil
- Kjeldahl digestion for nitrogen analysis in plant tissue and soil
- Metal speciation by X-ray Absorption Spectroscopy (XAS) includes both Extended X-Ray Absorption Fine Structure (EXAFS) and X-ray Absorption Near Edge Structure (XANES).
- Image Techniques for metal localization by X-Ray Fluorescence and Laser Ablation-MS.
- Proteomics : SDS-PAGE, enzymatic activity and immunoblotting.
- Physical-Chemical soil characterization: pH, electric conductivity (EC), organic matter, total nitrogen, cation exchange capacity (CEC).

Language

English: effective communication skills including the ability to present findings at international meetings, write research reports and publish in refereed journals.

Curses

- Liquid chromatography coupled to mass spectrophotometer (CSIC), Madrid (Spain), 2013 (28h)
- Synchrotron application and material characterization (CSIC), Sevilla, (Spain), 2009 (24 h)
- Data analysis by SPSS (CIEMAT), Madrid (Spain), 2008 (27h)
- Soil degradation and restoration (CIEMAT), Madrid, (Spain), 2007 (50h)
- Ecological Agriculture and Environmental Protection (UPM), Madrid (Spain), 2004 (50h)

International publication (with ISI impact source, plant science)

1. **Carrasco-Gil S**, Rios JJ, Álvarez-Fernandez A, Abadia A, García-Mina JM, Abadia J. Effects of individual and combined metal foliar fertilizers on iron- and manganese-deficient *Solanum lycopersicum* plants. *Plant and Soil* (accepted). (Q1, FI : 2.952)
2. Hernandez LE, Sobrino-Plata J, Montero-Palmero B, **Carrasco-Gil S**, Flores-Cáceres L, Ortega-Villasante C, Escobar C. Contribution of glutathione to the control of cellular redox homeostasis under toxic metal and metalloid stress. *Journal of Experimental Botany* (doi: 10.1093/jxb/erv063). (Q1, FI: 5,79)
3. Sobrino-Plata J, **Carrasco-Gil S**, Abadía J, Escobar C, Alvarez-Fernández, Hernandez LE. The role of glutsthione in mercury tolerance resembles its function under cadmium stress in Arabidopsis. *Metallomics*, 2014, (doi: 10.1039/C3MT00329A). (Q2, FI:3.908).
4. **Carrasco-Gil S**, Siebner H, LeDuc DL, Webb S, Millán R, Andrews JC, Hernández LE. Mercury Localization and Speciation in Plants Grown Hydroponically or in a Natural Environment. *Environmental Science & Technology*, 2013, 47, 3082-3090. (Q1, FI: 5.2)
5. Sobrino-Plata J, Herrero J, **Carrasco-Gil S**, Pérez-Sanz A, Lobo C, Escobar C, Millán R, Hernández LE. Specific stress responses to cadmium, arsenic and mercury appeared in the metallophyte *Silene vulgaris* grown hydroponically. *RSC Advances,* 2013, *3, 4739*. (Q1, FI: 3.708)
6. **Carrasco-Gil S**, Estebaranz-Yubero M, Medel-Cuesta D, Millan R, Hernandez LE. Influence of nitrate fertilization on Hg uptake and oxidative stress parameters in alfalfa plants cultivated in a Hg-polluted soil, *Environmental and Experimental Botany*, 2012, 75, 16-24. (Q1, FI: 2.57)
7. **Carrasco-Gil S**, Álvarez-Fernández A, Sobrino-Plata J, Millán R, Carpena-Ruiz RO, LeDuc DL,

Andrews JC, Abadía J, Hernández LE. Complexation of Hg with phytochelatins is important for plant Hg tolerance. *Plant, Cell and Environment,* 2011, 34, 778-791. (Q1, FI: 5.14)

8. Millan R, Schmid T, Sierra MJ, **Carrasco-Gil S**, Villadóniga M, Rico C, Ledesma DMS, Puente FJD. Spatial variation of biological and pedological properties in an area affected by a metallurgical mercury plant: Almadenejos (Spain). *Applied Geochemistry*, 2011, 26, 174-181. (Q2, FI:2.017)

Other publications (agronomical and environmental magazines and book chapters)

1. **Carrasco-Gil S**, El-Jendoubi H, Rios JJ, Fernández B, Abadia J, Abadía A (2015). Fertilización foliar con Fe: un mismo objetivo en estudios de campo y laboratorio. Vida Rural: 46-54.
2. Hernández LE, Sobrino-Plata J, Flores-Cáceres ML, **Carrasco-Gil S**, Escobar C, del Campo F. (2012). Alteraciones fisiológicas en plantas asociadas a contaminación por metales pesados. Técnicas de análisis holístico. En el libro: Evaluación y recuperación de emplazamientos degradados y/o contaminados. Ciemat (eds), Pp. 291-318
3. Millán R, Schmid T, Cardona AI, Puente FJD, Sierra MJ, **Carrasco S**, Rico C, Villadóniga M, Rodríguez V, Mejuto M, García A. (2008). Suelos con altos contenidos de mercurio y estrategias de rehabilitación. Infoenviro, available in http://www.infoenviro.es
4. **Carrasco-Gil S**, Millán R. (2008). Influencia de la adición de fertilizantes y enmendantes orgánicos en suelos contaminados por mercurio. Informes Técnicos-CIEMAT 1153 (eds), Pp. 1-98
5. Sierra MJ, Millán R. & **Carrasco S.** (2007). Cambios de usos del suelo. En el libro: Contaminación de Suelos. Tecnologías para su Recuperación. Ciemat (eds), Pp. 343-365

Oral comunications

1. Effect of individual and combined Fe and Mn foliar treatments on metal-deficient tomato plants. **Carrasco-Gil S**, Álvarez-Fernández A, Abadía A, García-Mina JM, Abadia J. XV Simposio Luso-Español de nutrición mineral de las plantas, Lisboa (Portugal), 6-8 diciembre 2014.
2. S-containing metabolites might be important for the detoxification of toxic elements in plants. **Sandra Carrasco-Gil**, Ana Álvarez-Fernández, Juan Sobrino-Plata, Rocío Millán, Ramón O. Carpena-Ruiz, Danika L. LeDuc, Joy C. Andrews, Javier Abadía, and Luís E. Hernández. 3rd Sulphyton Meeting on PLant Sulfur Research, Padova (Italia), 29 septiembre-1 octubre, 2011.
3. Mercury localization and speciation in alfalfa (Medicago sativa) grown in hydroponic system. **S. Carrasco-Gil**, H. Siebner, J.C. Andrews, DL. LeDuc, R. Millán, L.E. Hernández. 11th International Conference of the Biogeochemistry of Trace Elements (ICOBTE). Florencia (Italia), 3-7 julio, 2011.
4. Soil and soil-plant studies in Almadén mercury mining district (Spain). R. Millán, M.J. Sierra, **S. Carrasco-Gil**, J. Rodríguez-Alonso, M. Rodríguez-Rastrero, F.J. Díaz Puente, T. Schmid. Workshop on Mercury in contaminated sites. Characterization, impacts and remediation. Piran (Eslovenia), 10-14 octubre, 2010.
5. Using Transmission X-ray microscopy, XAS, and μ-XRF to study Hg accumulation and transformation in Spartina foliasa and Medicago sativa. C. Andrews, **S. Carrasco-Gil**, D. LeDuc, C. Patty, R. Millán and L. E. Hernández. ACS American Chemical Society. Chemestry for Life. San Francisco (EEUU), 21-25 marzo, 2010.
6. Soluble mercury is associated with phytochelatins in root. **Sandra Carrasco-Gil**, Ana Álvarez-Fernández, Rocío Millán, Ramón O. Carpena-Ruíz, Javier Abadía and Luis E. Hernández. Phyto 2009-COST Action 859 Final Conference. Phytotechnologies to promote sustainable land use and improve food safety. Ascona (Suiza), 11-16 octubre, 2009.

7. Soluble mercury is associated with phytochelatins in root. **Sandra Carrasco-Gil**, Ana Álvarez-Fernández, Rocío Millán, Ramón O. Carpena-Ruíz, Javier Abadía and Luis E. Hernández. XVIII Reunión de la Sociedad Española de Fisiología Vegetal (SEFV. XI Congreso Hispano-Luso de Fisiología Vegetal. Zaragoza (España), 8-11 septiembre, 2009.

8. Potencial Cultivation of Crops as an Alternative Economical Source in the Almadén Mining Area. **S. Carrasco**, M.J. Sierra, R. Millán, E. Esteban, T. Schmid, R.O. Carpena. 12 th International Congress on Energy and Mineral Resources. Oviedo (España), 7-11 octubre, 2007.

Poster presentation

1. Spatial distribution of Fe in leaf sections of Fe-treated peach tree using imaging laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS). **Carrasco-Gil S**, Fernández B, Pereiro R, García-Alonso I, Gogórcena Y, Abadía A, Abadía J, Álvarez-Fernández A. XVII International Symposium on iron nutrition and interactions in plants. Gatersleben (Alemania), 6-10 July, 2014.

2. Imaging studies of Trace elements in biological samples by LA-ICP-MS: Analysis of leaf and seed sections. Fernández B, Carrasco-Gil S, Díaz-Benito, P, Banakar R, Álvarez-Fernández A, Christou P, García-Alonso JI, Pereiro R. European Workshop on Laser Ablation. Royal Holloway University of London (London, UK), 8-11 July 2014.

3. Mercury distribution in an abandoned metallurgical plant. R. Millán, M.J. Sierra, T. Schmid, **S. Carrasco-Gil**, D.M. Sánchez-Ledesma, F.J. Díaz-Puente. International Conference on Heavy Metals in the Environment (16 ICHMET). Roma (Italia), 23-27 septiembre, 2012.

4. Nitrate nutrition status modulates stress responses of alfalfa plants to mercury. **S. Carrasco-Gil**, D. Medel-Cuesta, R. Millán, L.E. Hernández. 9th International Conference on Phytotechnologies. Hasselt (Bélgica), 11-14 septiembre, 2012.

5. High levels of nitrogen fertilization decrease mercury phytotoxicity in alfalfa plants. **Sandra Carrasco-Gil**, David Medel Cuesta, Rocío Millán y Luis E. Hernández. XIV Simposio Hispano-Luso de Nutrición Mineral de Plantas. Cantoblanco (Madrid), 23-26 julio, 2012.

6. Hard X-ray imaging of mercury accumulation in plants. J. C. Andrews, **S. Carrasco-Gil**, D. LeDuc, L. E. Hernández, R. Millán, Y. Liu, F. Meirer, S. Webb, P. Pianetta. The 10th International Conference on X-Ray Microscopy. Chicago (EEUU), 15-20 agosto, 2010.

7. Physiological effects of Hg in alfalfa plants grown in a soil contaminated with mercury with two different nitrogen nutritional statuses. **S. Carrasco-Gil**, M. Estebaranz, D. Medel, LE. Hernández, R. Millán. SETAC Europe 20th Annual Meeting. Science and Technology for Environmental Protection. Sevilla (España), 23-27 mayo, 2010.

8. Influence of the nitrogen nutritional status in the stress responses to mercury in alfalfa (Medicago sativa). **Sandra Carrasco-Gil**, Rocío Millán, David Medel and Luis E. Hernández. 10th International Conference of the Biogeochemistry of Trace Elements (ICOBTE). Chihuahua (Mexico), 13-16 julio, 2009.

9. Búsqueda de especies vegetales en el distrito de Almadén para su posterior uso en técnicas de fitorremediacion en espacios contaminados por mercurio .M.Villadóniga, R. Millán, R. Gamarra, T. Schmid, A.I. Cardona, M.J. Sierra, **S. Carrasco**. Problemática postminera derivada de la explotación de sulfuros metálicos. Sevilla, España, 17-19noviembre, 2008.

10. Study of Vicia sativa as a safe cultivation for livestock feeding in an area with high natural mercury levels background. R. Millán, M.J. Sierra, E. Esteban, **S. Carrasco**. International Conference on Heavy metals in the Environment (14th ICHMET). Taipei (Taiwan), 16-23 noviembre, 2008.

11. Environmental concerns related with the presence of mercury in soils and vegetation from Almadén mercury mining district: a health risk for the population?. R. Millán, P. Higueras, M.J. Sierra, J.M. Esbrí, M.A. López-Berdonces, T. Schmid, **S. Carrasco**, A.I. Cardona, E.M. García-

Noguero, W. Llanos. 14th International Conference on Heavy metals in the Environment (14th ICHMET). Taipei (Taiwan), 16-23 noviembre, 2008.

12. Influencia del estatus nutricional nitrogenado en la respuesta de estrés a mercurio en plantas de alfalfa (Medicago sativa). **Sandra Carrasco-Gil**, Rocío Millán, Luis E. Hernández. XII Simposio Ibérico sobre Nutrición Mineral de las Plantas-NUTRIPLANT. Granada (España), 22-24 octubre, 2008.
13. Safe crop cultivations in a mercury mining area?. R. Millán, R.O. Carpena, M.J. Sierra, E. Esteban, **S. Carrasco**, T. Schmid. COST Action 859 WG1 and WG3 meeting. Sede Boqer (Israel), 23-25 octubre, 2007.
14. Effect of soil amendments and extractant solutions on soil with high Hg concentration". **S. Carrasco**, I. Carrasco, R. Millán, E.López-Samaniego and M.C. Díaz. 9th International Conference of the Biogeochemistry of Trace Elements (ICOBTE). Beijin (China), 15-19 julio, 2007.
15. Mercury accumulation in Cistus ladanifer under the influence of mining activities in Almaden area. **S. Carrasco**, O. Grebler, S. Vazquez, M.J. Sierra, R.O. Carpena and R. Millán. COST Action 859 Work Group 4 and Work Group 2 meeting. Vilnius (Lithuania), 30 mayo -1 julio, 2007.
16. Mercury absorption in several species of the genus cistus. **S. Carrasco**, O. Grebler, R. Millán, A.I. Cardona, S. Vazquez and G. SETAC Europe 16th Annual Meeting. Oporto (Portugal), 20-24 mayo, 2007.
17. Influence of the mining activities in soils of the rambla El Beal, Spain. E. Noruega, L.F. Rodriguez, R. Millán, F.J. Díaz, A. I. Cardona, G. García and **S. Carrasco**. SETAC Europe 16th Annual Meeting. Oporto (Portugal), 20-24 mayo, 2007.
18. Influence of the addition of fertilizers and organic matter on a mercury contaminated soil. **S. Carrasco**, R. Millán. SETAC Europe 16th Annual Meeting. La Haya (Holanda), 7–11 mayo, 2006.

Project participation

2015-2017 CROP FORTIFICATION USING SPECIAL AND DEGRADABLE MICRONUTRIENT FERTILIZERS. FOLIAR APPLICATIONS. Ministry of Economy, Spain.

2013-2015 MULTI-ELEMENTAL FOLIAR FERTILIZERS WITH AGRONOMIC HIGH EFFICIENCY. Ministry of Economy, Spain.

2010-2013 PROSPECTION OF BIOMARKERS RESPONDING TO HEAVY METALS (AGL2010-15151 PROBIOMET). Ministry of Science and Innovation, Spain.

2010-2013 EVALUATION AND RECOVERY TECHNOLOGIES OF CONTAMINATED SITES (EIADES S505/AMB-1475). Educational Council, Community of Madrid, Spain.

2007-2010 CHARACTERIZATION OF PLANT RESISTANCE MECHANISMS TO ABIOTIC STRESS Ramón Areces Foundation.

2006-2010 EVALUATION OF THE ENVIRONMENTAL IMPACT AND RESTORATION OF THE NATURAL ENVIRONMENT IN CONTAMINATED SITES (S-0505/AMB/0296 EIADES). Educational Council, Community of Madrid, Spain.

2007-2009 PHYTOREMEDIATION WITH AGRICULTURAL PLANTS OF LOCATIONS AFFECTED BY MERCURY IN ALMADEN AREA (POII10-0087-6458 FITOALMA). Community of Castilla-La Mancha

2006-2009 RECOVERY OF MERCURY CONTAMINATED SOILS. RECOMMENDATIONS FOR SOIL AND PLANT USES IN ALMADEN AREA. (CTM2005-04809/TECNO-REUSA). Ministry of Science and Innovation, Spain.