

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

29/11/2023

First name	Rosa María		
Family name	Morcuende Morcuende		
Gender (*)	Female	Birth date	30/10/1966
Social Security, Passport, ID number	04169531E	URL Web http://www.irnasa.csic.es/grupo-fotosintesis	
e-mail	rosa.morcuende@irnasa.csic.es		
Open Researcher and Contributor ID (ORCID) (*)		http://orcid.org/0000-0002-1662-3961	

(*) Mandatory

A.1. Current position

Position	Research Scientist		
Initial date	19/12/2017		
Institution	Spanish National Research Council (CSIC)		
Department/Center	Abiotic Stress	Institute of Natural Resources and Agrobiology of Salamanca (IRNASA)	
Country	Spain	Teleph. number	923386402
Key words	Carbon metabolism, nitrogen metabolism, gene expression, photosynthesis, climate change, plant physiology, plant nutrition, water relations, enzyme activities, carbohydrates, nitrate, nutritional quality, wheat, cereals		

A.2. Previous positions (research activity interruptions, see call)

Period	Position/Institution/Country/Interruption cause
2006-2017	Tenured Scientist. IRNASA-CSIC. Spain
2003-2006	Ramón y Cajal Contract. IRNASA-CSIC. Spain
2001-2003	Postdoctoral Researcher. I3P Postdoctoral Program CSIC. IRNASA-CSIC. Spain
2000-2001	Postdoctoral Researcher. Project 1FD97-0468. IRNASA-CSIC. Spain
1997-2000	Postdoctoral Researcher. Program for the Incorporation of Doctors and Technologists MEC. IRNASA-CSIC. Spain
1996-1997	Postdoctoral Fellow Sonderforschungsbereiche (SFB). Botanical Institute. University of Heidelberg. Germany
1994-1996	Postdoctoral Fellow European Commission. Botanical Institute. University of Heidelberg. Germany
1990-1993	Predocctoral Fellow Ministry of Education and Science (MEC). IRNASA-CSIC. Spain

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
PhD Pharmacy	University of Salamanca. Spain	1994
BSc Pharmacy	University of Salamanca. Spain	1989

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

The research activity of Rosa Morcuende (RM) focuses on the study of the regulation of plant primary C-N metabolism and growth for understanding the adaptation mechanisms to a fluctuating environment. RM started her scientific career as a **Predocctoral Fellow** at IRNASA investigating the regulation of photosynthesis by sink demand. Major results were that inhibition of photosynthesis by reduced sink demand in wheat does not decrease photophosphorylation, but does reduce ribulose-1,5-bisphosphate (RuBP) carboxylation and, in the short term, RuBP regeneration. After being awarded a **European Postdoctoral Fellowship** (actual Marie-Sklodowska-Curie), RM joined to Prof. Mark Stitt's group (Heidelberg University, Germany) to improve understanding of the close coordination between the C and N metabolism to facilitate the optimization of plant

resources in its response to the environment. RM investigated the role of carbohydrates and nitrate as nutrients and signals in regulating the N assimilation. We discovered that nitrate induces the expression of N metabolism related genes, including nitrate reductase (NR), and increases the activity of the enzyme, whereas glutamine decreases the activity and activation state of NR. Carbohydrates act in concert with nitrate and antagonistically to glutamine to increase NR activity and N assimilation. In 1997, RM returned to IRNASA as a **MEC Postdoctoral Researcher** to perform pioneering research in Spain on the impact of climate change on wheat productivity and quality under field conditions to mimic expected future climate scenario, using temperature-gradient chambers. Soon after, we initiated a new research line on the regulation of fructan biosynthesis by nutrients as a **I3P Postdoctoral Researcher**. We uncovered the biochemical and molecular mechanisms involved in the nitrate and phosphate induced decrease in fructans, while nitrate is a negative signal for fructosyltransferases gene expression, phosphate inhibits sucrose phosphate synthase activity, decreasing the sucrose content, the substrate for fructan synthesis. Later, RM got a **Ramón y Cajal** competitive contract and, in 2006, a position as **Tenured Scientist**, promoting to **Research Scientist** in 2017. Her activity aimed to understand the regulatory mechanisms involved in the adaptation response of wheat to the concurrence of adverse environmental factors, mainly those related to climate change, and its dependence on N availability. Major contributions were: i) elevated CO₂ down-regulated the photosynthetic capacity and led to a loss of N compounds associated with the repression of genes for photosynthesis and N assimilation, being more pronounced at low N supply; ii) the negative effects of high temperature on photosynthesis can be partially compensated by elevated CO₂; iii) development of a qRT-PCR platform for gene expression analysis of C-N metabolism; iv) the first *de novo* RNA sequencing analysis in durum wheat under future climate change scenario allowed the identification of key target genes for crop improvement.

RM is currently leading the **Consolidated Research Unit of Castilla y León** UIC044. We have broadened our scientific objectives using the exploration of natural genetic diversity as a powerful approach, not only for the selection of improved crop varieties under combined elevated CO₂ and temperature, but also for dissecting the effect of nutrients and water availability on grain yield and nutritional quality. RM is a **guarantor of the Structure of Excellence** awarded to IRNASA (2021-2024) and a member of scientific networks (FiRCMe, CERES and AGROFOR). RM has the I3 certificate (MEC, 2007) and has participated in more than 30 projects (as PI in half of them), being currently PI in a national and a regional project. RM has supervised 4 PhD Theses (2 with International Mention and Extraordinary Doctorate Award by Salamanca University in 2015 and 2022, the 4 doctors continue their scientific careers and one of them has recently got a RyC contract) and other 3 (ongoing), 2 MSc and 2 BSc Theses and 4 postdocs, as well as the upcoming supervision of a Juan de la Cierva. RM has participated in management activities at IRNASA, as personnel representative on the Institute Board (2007-2011), head of the Abiotic Stress department (2011-2015), Photosynthesis Group leader (2015-2023), being Vicedirector for Research since 2019. RM has been member of the evaluation panels for the Ramón y Cajal program (2017), the call for projects of the Area of Agricultural Sciences and Agrifood (2010 and 2022) and their scientific-technical monitoring (2010), as well as the Scientific Committee of Agriculture of DEVA-ACC (2016-2021) and ACCUA Technical Collaborator (2023). RM participates in academic activities, as a member of the Quality Assurance Commission of the USAL PhD Agrobiotechnology Program, and in outreach activities, including an article in *The Conversation*, an interview on CyLTV (Surcos Program), on Radio USAL and on TV5 news (2021-2023).

Part C. RELEVANT MERITS

C.1. Publications (10 most relevant publications in the last 5 years, Corresponding author*)

1. Martínez-Peña R., Vergara-Díaz O., Schlereth A., Höhne M., **Morcuende R.**, Nieto-Taladriz M.T., Araus J.L., Aparicio N., Vicente R.* (2023) Analysis of durum wheat photosynthetic organs during grain filling reveals the ear as a water stress-tolerant organ and the peduncle as the largest pool of primary metabolites. *Planta*, 257(4), 81, [doi:10.1007/s00425-023-04115-1](https://doi.org/10.1007/s00425-023-04115-1). (Q1, Rank Plant Sciences: 46/239, I.F.: 4.3).
2. Bendou O., Gutiérrez-Fernández I., Marcos-Barbero E.L., Bueno-Ramos N., Miranda-Apodaca J., González-Hernández A.I., **Morcuende R.***, Arellano J.B.* (2022) Physiological and antioxidant response to different water regimes of flag leaves and ears of wheat grown under combined elevated CO₂ and high temperature. *Plants* 11(18), 2384, [doi:10.3390/plants11182384](https://doi.org/10.3390/plants11182384). (Q1, Rank Plant Sciences: 43/239, I.F.: 4.5).
3. Martínez-Peña R., Schlereth A., Höhne M., Encke B., **Morcuende R.**, Nieto-Taladriz M.T., Araus J.L., Aparicio N., Vicente R.* (2022) Source-sink dynamics in field-grown durum wheat under contrasting nitrogen supplies: key role of non-foliar organs during grain filling. *Frontiers in Plant Science* 13, 869680, [doi:10.3389/fpls.2022.869680](https://doi.org/10.3389/fpls.2022.869680). (Q1, Rank Plant Sciences: 27/239, I.F.: 5.6).
4. González-Hernández A.I.*, Schalschi L., Vicedo B., Marcos-Barbero E.L., **Morcuende R.**, Camañes G. (2022) Putrescine: a key metabolite involved in plant development, tolerance and resistance responses to stress.

- International Journal of Molecular Sciences* 23(6), 2971, [doi:10.3390/ijms23062971](https://doi.org/10.3390/ijms23062971). (Q1, Rank Biochemistry and Molecular Biology: 66/285, I.F.: 5.6).
5. Bendou O., Gutiérrez-Fernández I., Marcos-Barbero E.L., Bueno-Ramos N., González-Hernández A.I., **Morcuende R.**, Arellano J.B.* (2022) Theoretical and experimental considerations for a rapid and high throughput measurement of catalase *in vitro*. *Antioxidants* 11(1), 21, [doi:10.3390/antiox11010021](https://doi.org/10.3390/antiox11010021). (D1, Rank Food Science and Technology: 13/142, I.F.: 7.0).
6. Marcos-Barbero E.L., Pérez P., Martínez-Carrasco R., Arellano J.B., **Morcuende R.*** (2021) Screening for higher grain yield and biomass among sixty bread wheat genotypes grown under elevated CO₂ and high-temperature conditions. *Plants* 10(8), 1596, [doi:10.3390/plants10081596](https://doi.org/10.3390/plants10081596). (Q1, Rank Plant Sciences: 39/239, I.F.: 4.658).
7. Marcos-Barbero E.L., Pérez P., Martínez-Carrasco R., Arellano J.B., **Morcuende R.*** (2021) Genotypic variability on grain yield and grain nutritional quality characteristics of wheat grown under elevated CO₂ and high temperature. *Plants* 10(6), 1043, [doi:10.3390/plants10061043](https://doi.org/10.3390/plants10061043). (Q1, Rank Plant Sciences: 39/239, I.F.: 4.658).
8. Gámez A.I., Vicente R., Sánchez-Bragado R., Jauregui I., **Morcuende R.**, Goicoechea N., Aranjuelo I.* (2020) Differential flag leaf and ear photosynthetic performance under elevated [CO₂] conditions during grain-filling period in durum wheat. *Frontiers in Plant Science* 11, 587958, [doi:10.3389/fpls.2020.587958](https://doi.org/10.3389/fpls.2020.587958). (D1, Rank Plant Sciences: 17/235, I.F.: 5.754).
9. Vicente R.*, Bolger A.M., Martínez-Carrasco R., Pérez P., Gutiérrez E., Usadel B., **Morcuende R.*** (2019) De novo transcriptome analysis of durum wheat flag leaves provides new insights into the regulatory response to elevated CO₂ and high temperature. *Frontiers in Plant Science* 10, 1605, [doi:10.3389/fpls.2019.01605](https://doi.org/10.3389/fpls.2019.01605). (D1, Rank Plant Sciences: 19/234, I.F.: 4.402).
10. Torralbo F.*, Vicente R., **Morcuende R.**, González-Murua C., Aranjuelo I. (2019) C and N metabolism in barley leaves and peduncles modulates the responsiveness to changing CO₂. *Journal of Experimental Botany* 70 (2), 599–611, [doi:10.1093/jxb/ery380](https://doi.org/10.1093/jxb/ery380). (D1, Rank Plant Sciences: 14/234, I.F.: 5.908).

C.2. Congress (selected oral communications or invited talks are indicated, Speakers*)

35 communications have been presented at national and international congresses in the last five years.

1. Marcos-Barbero E.L.*, Bueno-Ramos N., Bendou O., Miranda-Apodaca J., Gibon Y., Gutiérrez-Fernández I., Arellano J.B., **Morcuende R.** Searching for potential foliar biomarkers for grain quality improvement of wheat grown under elevated CO₂ and high temperature with different nitrogen availability using multivariate methods. *The Fifth Symposium on Cereal Physiology and Breeding*. Lleida 2023.
2. Marcos-Barbero E.L.*, Pérez P., Martínez-Carrasco R., Arellano J.B., Boyero M.A., Verdejo A.L., **Morcuende R.** Natural variation of grain yield and photosynthesis components in a population of sixty wheat genotypes grown under elevated CO₂ and high temperature conditions. *X Plant Genetic Improvement Congress*. Pontevedra 2022. Invited talk.
3. Vicente R.*, Vergara-Díaz O., Kefavuer S.C., Martínez-Peña R., Sánchez-Bragado R., Aparicio N., **Morcuende R.**, Araus J.L. New avenues for crop improvement: integration of phenotyping with plant central metabolism and the key role of cereal inflorescences. *XV Portuguese-Spanish Symposium on Plant Water Relations (Online)*. Lisbon 2022. Invited keynote talk.
4. Marcos-Barbero E.L.*, Pérez P., Martínez-Carrasco R., Miranda-Apodaca J., Arellano J.B., Gibon Y., **Morcuende R.** Wheat diversity and climate change: Impact of elevated CO₂ and temperature on central metabolism and grain nutritional quality. *XXIII Meeting of the Spanish Society of Plant Physiology*. Pamplona 2019. E.L. Marcos-Barbero received a student scholarship from the congress organization.

C.3. Research projects (Participation in projects in the last 5 years)

1. **Project title:** Spanish wheat landraces: a healthy source of genetic variability for fighting wheat intolerances and its response to climate change, SAFESPAWHEAT (Ref. TED2021-129733B-I00). **Funding agency:** State Plan of R+D+I Strategy Projects Oriented to the Ecological and Digital Transition of the AEI/MICINN. **Principal investigator:** Francisco Barro Losada (IAS-CSIC). **Start-end date:** 01/12/2022-30/11/2024. **Total funding:** 264,500 €. **Type of participation:** Researcher.
2. **Project title:** Development of maize varieties with double use in a scenario of climate change, DUALCORN (Ref. TED2021-129405B-I00). **Funding agency:** State Plan of R+D+I Strategy Projects Oriented to the Ecological and Digital Transition of the AEI/MICINN. **Principal investigator:** Ana María Butrón Gómez (MBG-CSIC). **Co-IP:** Rogelio Santiago Carabelos. **Start-end date:** 01/12/2022-30/11/2024. **Total funding:** 218,500 €. **Type of participation:** Researcher.
3. **Project title:** Unit of Excellence IRNASA-CSIC (Ref. CLU-2019-05). **Funding agency:** Structure of Excellence Program of Junta de Castilla y León (European Regional Development Fund, ERDF). **Principal**

investigator: María del Mar Siles Lucas. **Start-end date:** 01/01/2021-31/12/2024. **Total funding:** 850,000 €. **Type of participation:** Guarantor Researcher.

4. Project title: Variability in wheat species response to water deficit under elevated CO₂ and temperature: Impact on primary, secondary and antioxidant metabolism and grain quality, WHEATERMET (Ref. PID2019-107154RB-I00). **Funding agency:** Spanish National Research Plan of R+D+I Oriented to Societal Challenges: “Retos Investigación”, Ministry of Science, Innovation and Universities. **Principal investigator:** Rosa Morcuende. **Co-IP:** Juan B. Arellano. **Start-end date:** 01/06/2020-31/05/2024. **Total funding:** 165,770 €.

5. Project title: Effect of nitrogen availability on the yield and composition of bioactive compounds in grain of wheat varieties grown in a CO₂-enriched atmosphere and elevated temperature (Ref. CSI260P20). **Funding agency:** Research Project Program Junta Castilla y León (European Regional Development Fund). **Principal investigator:** Rosa Morcuende. **Start-end date:** 01/01/2021-31/12/2023. **Total funding:** 172,000 €.

6. Project title: Optimization of an enzyme activity assay platform to investigate genetic variation in wheat performance at the high temperature and CO₂ concentration foreseen with climate change and its dependence on nitrogen availability, OPTENZWHEAT (Application ID: 178). **Funding agency:** 2nd Call for Transnational Access to European Plant Phenotyping Facilities EPPN2020, European Commission. **Principal investigator:** Rosa Morcuende. **Start-end date:** 01/02/2019-30/04/2019. **Total funding:** 30,000 €.

7. Project title: Genotypic variability of wheat in the C-N homeostasis and the antioxidant capacity and its dependency of nitrate availability in the future climatic scenario, GEHONIC (Ref. AGL2016-79589-R). **Funding agency:** Spanish National Research Plan of R+D+I Oriented to Societal Challenges, Ministry of Economy and Competitiveness (ERDF). **Principal investigator:** Rosa Morcuende. **Start-end date:** 30/12/2016-31/12/2020. **Total funding:** 145,200 €.

Research network projects

1. Project title: CSIC Scientific network “Conexión Trigo”, Wheatnet. **Funding agency:** Program Conexiones CSIC, implementation procedure and evaluation of the CSIC scientific networks. **Network coordinator:** Francisco Barro Losada (Instituto de Agricultura Sostenible, IAS-CSIC). **Deputy coordinator:** Rosa Morcuende Morcuende (IRNASA-CSIC). **Start-end date:** 01/01/2024-31/12/2025. **Total funding:** 200,000 €. Participation of 59 researchers from CSIC, universities and other public research organizations.

2. Project title: Research network in resilient quality cereals for Spanish food security, CERES (Ref. RED2022-134922-T). **Funding agency:** State Program to promote scientific-technical research and its transfer, Research networks 2022, Ministry of Science and Innovation. **Network coordinator:** Ernesto Igartua Arregui (Estación Experimental de Aula Dei, EEAD-CSIC). **Principal investigator IRNASA-CSIC:** Rosa Morcuende Morcuende. **Start-end date:** 01/06/2023-31/05/2025. **Total funding:** 18,000 €. Participation of 14 partners from CSIC, universities and other public research organizations.

3. Project title: Excellence network “Physiology for breeding cereal yield and quality”, FiRCMe (Ref. AGL2016-81855-REDT). **Funding agency:** State Plan of R+D+I for dynamization actions “Excellence Networks”, Ministry of Economy and Competitiveness. **Network coordinator:** Gustavo A. Slafer Lago (University of Lleida). **Principal investigator IRNASA-CSIC:** Rosa Morcuende Morcuende. **Start-end date:** 01/07/2017-31/12/2020. **Total funding:** 20,000 €. Participation of 9 partners from different universities, CSIC centers and other public research organizations.

C.4. Contracts, technological or transfer merits

Participation in operational group (9 partners: companies, AGROFOR, agricultural associations).

1. Project title: Development of a digital environment and living laboratories to value plant genetic resources of agricultural interest, FITONET (Ref. REGAGE22e00014997141). **Funding agency:** State Program of Rural Development, MAPA. NextGeneration EU. **Principal investigator:** Fundación CELLBITEC. **Start-end date:** 01/04/2022-31/03/2025. **Total funding:** 594,138 €. **Type of participation:** Researcher AGROFOR.

Participation in agreements with private companies within the framework of different projects.

2. Project title: Effect of nitrogen availability on the yield and composition of bioactive compounds in grain of wheat varieties grown in a CO₂-enriched atmosphere and elevated temperature. **Private companies:** Fundación CARTIF, Fertilizantes Félix Beltrán, Biocompostajes Laso. **Start-end date:** 01/01/2021-31/12/2023. **Principal investigator:** Rosa Morcuende Morcuende.

3. Project title: Genotypic variability in wheat grain nutritional quality in the future climatic scenario. **Private companies:** Fundación CARTIF, CECOSA Semillas SL. **Start-end date:** 01/01/2016-31/12/2018. **Principal investigator:** Rosa Morcuende Morcuende.

4. Project title: Molecular and functional changes with potential impact in the adaptation to the increase in atmospheric CO₂ in barley. **Funding company:** CECOSA Semillas SL. **Principal investigator:** Pilar Pérez Pérez. **Start-end date:** 01/03/2013-31/12/2016. **Total funding:** 9,000 €. **Type of participation:** Researcher.