

**ABBREVED CURRICULUM VITAE (CVA) – maximum 4 PAGES**

Part A. PERSONAL INFORMATION		CV date	2023-07-11
First and Family name	Francisco Barro Losada		
Social Security, Passport, ID number	30474943N	Birth date	7/11/1961
Researcher codes	ORCID (**)	0000-0002-7652-229X	
	SCOPUS Author ID (*)	6701819572	
	WoS Researcher ID (*)	E-8572-2017	

(\*) Optional

(\*\*) Mandatory

### A.1. Current position

Name of University/Institution	Instituto de Agricultura Sostenible, CSIC		
Department	Plant Breeding		
Address and Country	Alameda del Obispo s/n, 14004-Córdoba, Spain		
Phone number	+34957499240	E-mail	<a href="mailto:fbarro@ias.csic.es">fbarro@ias.csic.es</a>
Current position	Professor of Research	From	02-01-2018
Key words	Cereals, CRISPR/Cas, gluten, RNAi		

### A.2. Education

PhD, Licensed, Graduate	University	Year
Degree in Biology	Córdoba	1987
PhD in Biology	Córdoba	1992

### A.4. General indicators of quality of scientific production (see instructions)

Number of Sexenios: 6

Number of publication records: 105 (Scopus)

H index: 36 Web of Science and Scopus

Publications as 1st or last author: 61/101 = 62%

Q1 publications: 78

Thesis supervised: 9; Thesis in progress: 2

Number of Patents: 4 (16 considering extensions to countries)

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

The PI has developed most of his research career in cereal breeding, applying the most cutting-edge technologies to develop high-added value varieties. The PI has excellent experience in classical breeding, genetic transformation, *in vitro* culture, and genetic engineering of cereals by both RNAi and CRISPR/Cas technologies. **F. Barro** has participated in 30+ R&D projects at regional, national and international levels, being PI in 20+. Technology transfer to the productive sector is an important activity, with 20+ technology contracts and 4 patents licensed with extensions to 15+ countries.

Among the most important scientific and technical achievements are:

1. Development of efficient wheat transformation protocols. Several publications were derived in [Nature Biotech.](#), [TAG](#), [JCS](#), etc.
2. Use of genetic transformation for wheat quality traits, including the bread-making quality. Several publications in [TAG](#), [JCS](#), [Mol. Breeding](#), [Plos One](#), etc.
3. Development of wheat varieties suitable for celiac people through RNA interference (RNAi). Several publications were derived in [PNAS](#), [JXB](#), [Plant J.](#), [Plant Biotech. J.](#), etc.
4. Application of CRISPR / Cas technology for wheat breeding. Obtaining wheat varieties with alpha-gliadin genes edited by CRISPR / Cas. Several publications were derived in [Plant J.](#), [Plant Biotech. J.](#), [Frontiers Plant Sci.](#), etc.



5. Four patents licensed to companies. In addition, up to 24 derived patents are already working in several countries outside the EU, such as the USA, Canada, Australia, Japan, Argentina, etc.,

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

#### **C.1. Publications** (relevants since 2016)

- Marín-Sanz, M., Barro, F. (2022) RNAi silencing of wheat gliadins alters the network of transcription factors that regulate the synthesis of seed storage proteins toward maintaining grain protein levels. *Front. Plant Sci.*, 13: 935851.
- Haro, C., Guzmán-López, M.H., Marín-Sanz, M., Sánchez-León, S., Vaquero, L., Pastor, J., Comino, I., Sousa, C., Vivas, S., Landa, B.B., Barro, F. (2022) Consumption of Triticum Bread Reduces Immunogenic Gluten Intake without Altering the Gut Microbiota. *Foods* 11: 1439.
- Guzmán-López, M.H., Marín-Sanz, M., Sánchez-León, S., Barro, F. (2021) A bioinformatic workflow for InDel analysis in the wheat multi-copy  $\alpha$ -gliadin gene family engineered with CRISPR/Cas9. *Int. J. Mol. Sci.*, 22: 13076.
- Guzmán-López, M.H., Sánchez-León, S., Marín-Sanz, M., Comino, I., Segura, V., Vaquero, L., Rivero-Lezcano, O.M., Pastor, J., Sousa, C., Vivas, S., Barro, F. (2021) Oral consumption of bread from an RNAi wheat line with strongly silenced gliadins elicits no immunogenic response in patients with celiac disease. *Nutrients*, 13: 4548.
- Marín-Sanz, M., Masaru Iehisa, J.C., Barro, F. (2021) Transcriptomic analysis of low-gliadin RNAi lines shows that silencing of gliadins provides an increase in the expression of stress-related genes and affects carbohydrate metabolism genes in bread wheat. *Crop J.*, 10: 194-203.
- Sánchez-León, S., Giménez, M.J., Barro, F. (2021). The  $\alpha$ -gliadins in Bread Wheat: Effect of Nitrogen Treatment on the Expression of the Major Celiac Disease Immunogenic Complex in Two RNAi Low-Gliadin Lines. *Front. Plant Sci.*, 12: 663653.
- Marín-Sanz, M., Giménez, M. J., Barro, F., Savin, R. (2020) Prolamin Content and Grain Weight in RNAi Silenced Wheat Lines Under Different Conditions of Temperature and Nitrogen Availability. *Front. Plant Sci.*, 11: 314.
- García-Molina, M. D., Giménez, M. J., Sánchez-León, S., Barro, F. (2019) Gluten Free Wheat: Are We There?. *Nutrients*, 11: 487.
- Haro, C., Villatoro, M., Vaquero, L., Pastor, J., Giménez, M., Ozuna, C., Sánchez-León, S., García-Molina, M.D., Segura, V., Comino, I., Sousa, C., Vivas, S. Landa, B.B., Barro, F. (2018). The Dietary Intervention of Transgenic Low-Gliadin Wheat Bread in Patients with Non-Celiac Gluten Sensitivity (NCGS) Showed No Differences with Gluten Free Diet (GFD) but Provides Better Gut Microbiota Profile. *Nutrients*, 10: 1964.
- Sanchez-Leon, S., Gil-Humanes, J., Ozuna, C. V., Giménez, M. J., Sousa, C., Voytas, D. F., Barro, F. (2018) Low-gluten, nontransgenic wheat engineered with CRISPR/Cas9. *Plant Biotech J*, 16(4): 902–910.
- García-Molina, M.D., Muccilli, V., Saletti, R., Foti, S., Masci, S., Barro, F. (2017) Comparative proteomic analysis of two transgenic low-gliadin wheat lines and non-transgenic wheat control. *J Proteomics*, 165:102-112.
- Ozuna, C.V., Barro, F. (2017) Safety evaluation of transgenic low-gliadin wheat in Sprague Dawley rats: an alternative to the gluten-free diet with no subchronic adverse effects. *Food Chem. Tox.*, 107:176-185.
- Gil-Humanes, J., Wang, Y., Liang, Z., Shan, Q. Ozuna, C.V., Sánchez-León, S. Baltés, N., Starker, C., Barro, F., Gao, C., Voytas, D. (2017) High efficiency gene targeting in hexaploid wheat using DNA replicons and CRISPR/Cas9. *Plant J.*, 89:1251-1262.
- Barro, F., Iehisa, J.C.M., Giménez, M.J., García-Molina, M.D., Ozuna, C.V. Comino, Sousa, C., Gil-Humanes, J. (2016) Targeting of prolamins by RNAi in bread wheat: effectiveness of seven silencing-

fragment combinations for obtaining lines devoid of coeliac disease (CD) epitopes from highly immunogenic gliadins. *Plant Biotech J*, 14: 986-996.

### **C.2. Research projects** (relevants since 2016)

- Title: Oats: pre-competitive development of varieties with new technological properties and functional foods for people suffering from GLUTEN/wheat intolerance  
Financing entity: Ministry of Science and Innovation. Reference: CPP2021-008449,  
PI: Francisco Barro. Start: 01/09/2022; End: 31/08/2025; budget: 233.337,00 €
- Title: Spanish wheat landraces: a healthy source of genetic variability for fighting wheat intolerances and its response to climate change  
Financing entity: Ministry of Science and Innovation. Reference: TED2021-129733B-I00,  
PI: Francisco Barro. Start: 01/12/2022; End: 31/12/2024; budget: 264.500,00 €
- Title: Redesign of wheat immunogenic proteins related to coeliac disease using CRISPR/Cas  
Financing entity: Ministry of Science and Innovation. Reference: PID2019-110847RB-I00,  
PI: Francisco Barro. Start: 01/06/2020; End: 31/05/2023; budget: 208.120,00 €
- Title: Redesign of wheat alpha-gliadins by CRISPR/Cas: base editors and primer editing to eliminate immunogenicity in relation to celiac disease while preserving their functionality.  
Financing entity: Junta de Andalucía. Reference: P20\_01005,  
PI: Francisco Barro. Start: 05/10/2021; End: 30/06/2023; budget: 140.000,00 €
- Title: Applications of the CRISPR / cas9 system in wheat biotechnology: characterization of mutants in alpha-gliadins and generation of new mutants in  $\omega$ - and  $\gamma$ -gliadins  
Financing entity: Ministry of Economy and Competitiveness. Reference: AGL2016-80566-P  
PI: Francisco Barro. Start: 01/01/2017; End: 31/12/2019; budget: 211.570,00 €
- Title: Use of new more efficient cereal species for animal feed and production of safer food for livestock.  
Funding entity: CDTI, INNTERCONECTA program. Reference: ITC-20151054  
PI-IAS: Francisco Barro. Start Date: 07/2015; End date: 06/12/2018; budget: 693.221,60 €
- Title: Characterization of new allelic variants of prolamins in Triticeae: potential for the selection of non-toxic varieties for celiacs and their introgression in cultivated varieties.  
Funding entity: Ministry of Innovation, Science, and Business. Reference: P11-AGR-7920.  
PI: Francisco Barro. Start date: 05/16/2013; End date: 09/30/2016; budget: 214.222 €
- Title: Allelic variants of coeliac disease in wheat: mutagenesis directed by specific nucleases (TALENs) of immunodominant genes  
Funding entity: Ministry of Economy and Competitiveness. Reference: AGL2013-48946-C3-1-R.  
PI: Francisco Barro. Start date: 01/01/2014; End date: 12/31/2016; budget: 229.900 €

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

- Title: EXPLOWHEAT\_ Exploring durum wheat genotypes to minimize drought stress impact on grain yield and nutritional quality  
Activity: R&D contract; Company: UNIVERSITY OF TUSCIA  
PI: Francisco Barro. Start date: 09/09/22; End date: 09/03/23. Funding: € 12,500.00
- Title: Molecular and biochemical characterization of wheat lines with low gliadin content  
Activity: R&D contract; Company: PLANT BIOSCIENCE LIMITED  
PI: Francisco Barro. Start date: 06/20/18; End date: 12/19/18. Funding: € 11,040.00
- Title: Use of new cereal species and more efficient fodder for animal feed and production of safer food for livestock  
Activity: R&D contract; Company: IOS SERVICIOS EMPRESARIALES, SL  
PI: Francisco Barro. Start date: 11/16/15; End date: 12/31/17. Funding: € 40,535.00
- Title: New industrial bakery products through the development of new starters and innovative flours of high quality  
Activity: Technology Support Contract; Company: AGRASYS, S.L.  
PI: Francisco Barro. Start date: 12/01/15; End date: 04/30/18. Funding: € 21,054.00



- Title: Use of new cereal species and more efficient fodder for animal feed and production of safer food for livestock  
Activity: R&D contract; Company: AGRASYS, S.L.  
PI: [Francisco Barro](#). Start date: 11/16/15; End date: 12/31/17. Funding: € 24,805.00

#### **C.4. Patents**

- Título: "SISTEMA DE ANDROESTERILIDAD GENICO-CITOPLASMICA EN TRIGO"  
Inventores: Martín, A, [Barro, F](#), Atienza, SG, Ramírez, MC, Martín, AC  
Referencia: [ES200803286](#)  
*Licencia: AGRASYS, SL (FECHA DE LICENCIA: 20/10/2009)*
- Título: "POLINUCLEOTIDO QUE COMPRENDE SECUENCIAS DE GLIADINAS DE TRIGO Y SU USO PARA SILENCIAMIENTO MEDIANTE RNAI"  
Inventores: Gil-Humanes, J., Pistón, F., Martín, A., [Barro, F](#).  
Referencia: [ES200900302](#)  
*Licencia: PLANT BIOSCIENCE LIMITED (FECHA DE LICENCIA: 08/11/2010)*  
Extensión internacional: [PCT/ES10/070045](#), Patente europea N° [EP10738233](#), Patente en Estados Unidos [US13/147151](#), Patente mejicana N° [MX007795](#), Patente rusa N° [RU20111136710](#), Patente japonesa N° [JP546884](#), Patente china [CN80006483](#), Patente australiana N° [AU2010210107](#), Patente canadiense N° [CA2.750.997](#), Patente india N° [IN6136/DELNP/2011](#)
- Título: "TRANSGENIC PLANTS"  
Inventores: [Francisco Barro](#)  
Referencia: [EP13382228](#)  
*Licencia: PLANT BIOSCIENCE LIMITED (FECHA DE LICENCIA: 22/07/2013)*  
Extensión internacional: [PCT/EP14/062870](#), Patente Europea N° [EP14732858](#), Patente americana N° [US14/899698](#)
- Título: "TARGETING OF PROLAMINS BY GENOME EDITING"  
Inventores: [Francisco Barro Losada](#), Susana Sánchez León y Javier Gil-Humanes  
Referencia: [EP17382335](#)  
*Licencia: PLANT BIOSCIENCE LIMITED (FECHA DE LICENCIA: 01/04/2016)*  
Extensión internacional: [PCT/EP18/064791](#)

#### **C.5. Congress and conferences**

International congresses: 40 oral presentations  
National Congresses: 42 oral presentations  
Invited conferences: 29

#### **C.6. R&D Management**

- Jefe del Departamento de Mejora Genética Vegetal del Instituto de Agricultura Sostenible.
  - Desde Marzo 2009 a Marzo 2011
- Adjunto de Mejora Genética del área de Agricultura de la Agencia Nacional de Evaluación y Prospectiva (ANEP).
  - Diciembre 2010 – Junio 2015
- Juan de la Cierva and Ramón y Cajal Contract Evaluation Committee
  - 2017-2018

#### **C.7 Awards**

- 2011 Caja Rural de Córdoba Foundation Award. Best Project (R+D+i) for agri-food research.
- Medal of the City of Palma del Río (2014) for research in the field of Biology.
- Al-Andalus Awards, 2017 edition.
- EXCELLENT Distinction, Andalusian Society for the Study of Food Intolerances (SAEIA).