

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	Antonio		
Family name	Molina Fernández		
Gender (*)	Male	Birth date (dd/mm/yyyy)	
ID number			
e-mail	antonio.molina@upm.es	URL Web:	www.cbgp.upm.es
Open Researcher and Contributor ID (ORCID) (*)	000-0003-3137-7938		

(*) Mandatory

A.1. Current position

Position	Full Professor (Catedrático de Universidad)		
Initial date	06/08/2010		
Institution	Universidad Politécnica de Madrid (UPM)		
Department/Center	Biología Vegetal/UPM	Centro de Biotecnología y Genómica de Plantas (CBGP, UPM-INIA/CSIC)	
Country	Spain	Teleph.number	(34) 669956541
Key words	Plant immunity, disease resistance, cell wall, glycans, receptors kinases		

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

Period	Position/Institution/Country/Interruption cause
3/06/1999-05/08/2010	Associated Professor (Profesor Titular)/UPM/Spain

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
Licensed in Biological Sciences	Universidad Autónoma de Madrid/Spain	1989
PhD in Biological Sciences	Universidad Politécnica de Madrid/Spain	1993

(Include all the necessary rows)

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

Dr. Molina scientific career has been focused on the **characterization of the molecular basis of plant disease resistance and the application of this knowledge to sustainable crop protection**. During his PhD (UPM) he characterized, for the first time, the mode of action and role in plant immunity of several families of **plant antimicrobial peptides**. These results were published in 14 articles with high impact in the field and one patent (PCT/EP2/01130) sold to Syngenta. During his post-doctoral (Syngenta, USA) he characterized different aspects of **systemic acquired resistance** (published in 8 articles) and developed technologies (patent WO98/29537) commercialized by Syngenta. Following his establishment as independent Investigator at UPM (1999), his main line of research was the genetic and molecular characterization of **plant resistance to necrotrophic fungi** using as model *Arabidopsis thaliana*/*Plectosphaerella cucumerina* interaction. His group has identified/characterized **key components of plant immunity**: heterotrimeric G protein, the receptor kinase ERECTA, YODA kinase and MKP1 phosphatase, among others (see publications). These components define **non-canonical immune pathways** whose activation **confer broad-spectrum disease resistance**. Also, the Molina's group has contributed significantly to the determination of **tryptophan-derived secondary metabolites to Arabidopsis disease resistance**. In the recent years, the group has focused on the **determination of plant cell wall role in Arabidopsis disease resistance**. New wall-derived glycans from pathogens/plant cell walls have been identified, which trigger novel immune responses and confer crop disease

resistance (see C1). These novel cell wall glycans are under development as agrobiologicals for application in sustainable agriculture (see C4 patents and collaborations with enterprises). The group has demonstrated the relevance of cell wall in plant adaptation to stresses and fitness and found specific correlation between wall composition (carbohydrate epitopes content) and these phenotypes. The group has also characterized a set of receptor kinases with Ectodomains harboring Leucine-Rich Repeat and Malectin domain (LRR-MAL RKs, IGP1-IGP4) that are required for the perception of different oligosaccharides and have demonstrated that **IGP1/CORK1 is the receptor (PRR) for cellulose-derived oligosaccharides, that represents a breakthrough in the field of glycans perception by plant immune system.**

Dr. Molina has published during his carrier 90 articles in Journal of WOS/Scopus (almost all in prestigious journals in the field of plant biology), and 45 in last 10 years. The relevance of these articles are supported by their impact in the field and the contributions to knowledge advances of the understanding of plant immunity mechanisms. This research activity has been recognized with 5 Sexenios Investigación (last in 2019) and 1 Sexenio Tecnológico (in 2018). Dr. Molina group is internationally recognized in the fields of cell wall-mediated immunity and plant disease resistance to necrotrophic fungi (invited speaker and organization of congress, see C2). Dr. Molina has done an **intense activity of R&I formation** supervising 12 PhDs in the last 10 years and with 5 PhD Thesis underway. All these researchers, except two, are linked to Science/Technology fields, with 4 being independent PIs. **Dr. Molina has developed an intense activity of innovation/technology transfer and entrepreneurship** in collaboration with national/international enterprises. His group has filled several international patents and has been exploiting 2 know-hows (product STEMICOL). He is co-founder of CBGP spin-off Plant Response Biotech (acquired by Mosaic company, USA), start-up FAIR Data Systems (2019) and of NDiscovery SL (2024). Dr. Molina has been Principal Investigator of 24 contracts with enterprises (1,2 million € in last 10 years, see C3).

Dr. Molina has performed an **intense activity of R&I management**: i) **Director of CBGP** (2/2016-2/2024) and **Scientific Director of Severo Ochoa grants to CBGP** (2017-2021 & 2022-2025); ii) **President of SOMMa** (2024-) and Vicepresident SOMMa (2020-2024); iii) Expert representative Spanish Research Agency (AEI) in National Biosafety Commission (2012-2024). He has been **Director of the Biotechnology and Biology Department-UPM** (July 2013-January 2015) and Executive Director of CBGP (2008-2012). He is Reviewer of grants for Science Foundation/Agencies: (NSF (EEUU and Switzerland), FWHO (Belgium), ANR (France), DGF (Germany), etc.) and Reviewer of articles in top Journals (e.g. Nature Comm., Nature Plants, EMBO J., Plant Cell, Molecular Plant). In the frame of the CEX program CBGP, Dr. Molina is **coordinating the international joint initiatives of the CBGP** with the Cluster of Excellence on Plant Sciences ([CEPLAS](#)) of Germany and the initiative Center of Excellence for Plant-Environment Interactions ([CEPEI](#)) with two institutes of the Chinese Academy of Science. These two initiatives are developing 12 joint projects (involving 12 PhD students) financially supported by CBGP, CEPLAS and CAS.

Part C. RELEVANT MERITS (sorted by typology)

C.1. Publications (see instructions)

1. **Molina, A.**, Sánchez-Vallet, A., Jordá, L., Carrasco-López, C., Rodríguez-Hervá, J.J., López-Solanilla, E. (2024). *Plant cell walls: source of carbohydrate-based signals in plant-pathogen interactions*. **Current Opinion in Plant Biology** 82, 102630 (1/8, **AC**).
2. Fernández-Calvo, P., López, G., Martín-Dacal, M., Aitouguinane, M., ... **Molina, A** (2024). *Leucine rich repeat-malectin receptor kinases IGP1/CORK1, IGP3 and IGP4 are required for Arabidopsis immune responses triggered by β -1, 4-D-Xylo-oligosaccharides from plants*. **The Cell Surface**, 11:100124 (10/10, **AC**).
3. **Molina, A**, Jordá, L. (AC), Torres, M.A., Martín-Dacal, M, Berlanga, DJ, Fernández-Calvo, P., Gómez-Rubio, E., Martín-Santamaría, S. (2024). *Plant cell wall-mediated disease resistance: Current understanding and future perspectives*. **Molecular Plant**, 17: 699–724. (1/8, **AC**).
4. Berlanga, D.J., **Molina, A.**, Torres, M.Á. (AC) (2024). *Mitogen-activated protein kinase phosphatase 1 controls broad spectrum disease resistance in Arabidopsis thaliana through diverse mechanisms of immune activation*. **Frontiers in Plant Science** 15: 1374194. (2/3, **AC**)

5. Rebaque, D., López, G., Sanz, Y., Vilaplana, F., Brunner, F., Mérida, H., **Molina, A.** (2023). *Subcritical water extraction of Equisetum arvense biomass withdraws cell wall fractions that trigger plant immune responses and disease resistance*. **Plant Molecular Biology** 113: 401-414 (7/7, **AC**).
6. Martín-Dacal, M., Fernández-Calvo, P., Jiménez-Sandoval, P.,... **Molina, A.** (2023). *Arabidopsis immune responses triggered by cellulose-and mixed-linked glucan-derived oligosaccharides require a group of leucine-rich repeat malectin receptor kinases*. **The Plant Journal**, 113: 833-850. (14/14, **AC**)
7. **Molina, A.***, Miedes, E.,... Goffner D. (2021). *Arabidopsis cell wall composition determines disease resistance specificity and fitness*. **Proced. Natl Acad. Sci. USA**, 118(5): e2010243118. (1/14, **AC**)
8. Rebaque, D., del Hierro, I.,... **Molina, A.**, Mérida, H. (AC) (2021). *Cell wall-derived mixed-linked β -1,3/1,4-glucans trigger immune responses and disease resistance in plants*. **Plant Journal**, 106:601-615. (12/13, **AC**)
9. Del Hierro, I., Mérida, H., Broyart, C., Santiago, J., **Molina, A.** (AC) (2021). *Computational prediction method to decipher receptor-glycoligand interactions in plant immunity*. **The Plant Journal**, 105:1710-1726. (5/5, **AC**) (Picture cover of the journal issue)
10. Mérida, H., Bacete, L., Ruprecht, C., Rebaque, D., Del Hierro, I., López, G., Brunner, F., Pfengle, F., **Molina, A.** (2021). *Arabinoxylan-oligosaccharides act as Damage Associated Molecular Patterns in plants regulating disease resistance*. **Frontiers in Plant Science**, 11:1210. (9/9, **AC**)
11. Téllez, J., Muñoz-Barrios, M., Sopeña-Torres, S., ... Jordá, L.* (AC), **Molina, A.** (2020). *YODA kinase controls a novel immune pathway of tomato conferring enhanced disease resistance to the bacterium Pseudomonas syringae*. **Frontiers in Plant Science**, 11:1569. (14/14, **AC**)
12. Bacete, L., ... **Molina, A.** (2020). *Arabidopsis Response Regulator 6 (ARR6) modulates plant cell wall composition and disease resistance*. **Mol. Plant Microbe Interact** 33:767-780. (10/10, **AC**)

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

1. **Plant Cell Wall Biology Meeting**. 27th-30th June 2021, Japan (online meeting). **Invited talk**.
2. **9th European Workshop on Plant Peptides and Receptors**. 8th-10th September 2021, Regensburg (Germany). **Invited talk**.
3. **Leibniz Plant Biochemistry Symposium on Plant Cell Walls**. 7th May 2021 Halle, Germany (online meeting). **Keynote invited speaker**
4. **Control of Cell Wall Integrity Annual Meeting (2021) UZH/ETH**. 19th-20th July 2021, Zurich (Switzerland). **Keynote speaker**.
5. **Encuentro Internacional sobre el Año Internacional de la Sanidad Vegetal**. 1st-2nd December 2021, Universidad de Cordoba (Spain). **Keynote invited speaker**.
6. **XVI Plant Cell Wall Congress**. 18th-22nd June (2023), Málaga (**A. Molina** and H. Mérida, organizers)
7. **Reunión Biología Molecular de Plantas**, Castellón, July 2024. **A. Molina**. **Keynote speaker**.
8. **Plant Cell Wall Congress**. 18th-22nd June, 2024, Santiago (Chile). **A. Molina**. **Invited talk**.
9. [PlantACT! conference 2025](#), Madrid. 7th-9th April, 2025, **A. Molina** and H. Hirt (Chairs)

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

1. Project Title: **Centro de Excelencia Severo Ochoa** (CEX2020-000999-S). Centro de Biotecnología y Genómica de Plantas (UPM-INIA/CSIC). **PI: A. Molina** (Scientific Director of the Project). Funder: Spanish Research Agency (AEI); Budget: 4,000,000 € + 14 FPIs; Duration: 1/01/2022-31/12/2025.
2. Project Title: **PANGREEN**. CBGP (UPM-INIA/CSIC). **PI: A. Molina**. Funder: Madrid Regional Government; Budget: 1,161,000 €; Duration: 1/01/2021-31/12/2022.

3. Project Title: **Transición hacia una agricultura sostenible basada en la economía circular y en nuevas soluciones de base biológica** (TED2021-130317B-I00). **Co-PI: A. Molina**. Funder: AEI; Budget: 230.000 €. Duration: 1/12/2022-30/4/2025
4. Project Title: Nuevos Mecanismos de percepción y señalización de la Inmunidad vegetal activados por patrones moleculares asociados al daño (DAMPs) de células vegetales (**DAMPSENSE**) (PID2021-126006OB-I00). **Co-PI: A. Molina**. Funder: AEI; Budget: 260.150 € + FPI Duration: 1/10/2022-30/09/2025.
4. Project Title: Desarrollo de metodologías para la producción y escalado de Glicanos de pared celular que regulan la inmunidad y resistencia a enfermedades de los cultivos (**PDC2022-133742-I00; SWEETIMMUNCROP**). **Co-PI: A. Molina**. Funder: AEI; Budget: 138.000 €. Duration: 1/10/2022-31/11/2024
5. Project Title: **DAMPTRIP**: Plant Triggered Immunity mediated by Damage-Associated Molecular Patterns) (RTI2018-096975-B-I00). **PI: A. Molina**. Funder: AEI. Budget: 224 k€; Duration: 1/07/2019-31/12/2021
6. Project Title: Development and application of cell wall derived oligosaccharides for improving sustainable agriculture. (**IND2017/BIO-7800**). **PI: A. Molina**. Funder: Madrid Regional Government/ Plant Response Biotech SL (Industrial PhD); Budget: 145 k€; Duration: 11/2/2018-31/1/2021.
7. Project Title: Analyzing plant cell wall integrity maintenance and its coordination with plant immunity (#315325). Funder: **Norwegian Research Agency**. PI: T. Hamman (NTUT); Budget A. Molina (50 k€); Duration: 6/2021-5/2024.
8. Project Title: **Centro de Excelencia Severo Ochoa** (SEV-2016-0672) Centro de Biotecnología y Genómica de Plantas (UPM-INIA). **PI: A. Molina** (Scientific Director of the Project). Funder: Spanish Research Agency; Budget: **4,000,000 € + 14 FPIs**; Duration: 1/07/2017-31/12/2021.
9. Project Title: **IMMUNOWALLSENSE** (Respuestas de inmunidad reguladas por la pared celular vegetal (BIO2015-64077-R). **PI: A. Molina**. Budget: 338,800 €. Duration: 1/07/2019-31/12/2021. Funder: AEI

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.

1. Title: Desarrollo tecnológico e industrial de nuevas biosoluciones para una agricultura sostenible. **PI: A. Molina**. Funder: **NDiscovery SL**: 90 k€; Duration: 1/1/2025-31/12/2025.
2. Title: BiocellVeg. **PI: A. Molina**. Funder: **Symborg**: 230 k€; Duration: 1/9/2022-31/12/2024.
3. Title: Technical support for sustainable agriculture product development. **PI: A. Molina**. Funder: **Nawter Tech SLU**: 60 k€; Duration: 1/1/2024-30/2/2025.
4. Title: Technological applications of plant innate immunity to agriculture. PI: A. Molina. Funder: **Plant Response Inc**. Budget: 60 k€; Duration: 1/6/2019-31/12/2024.
5. Title: Technological applications of plant immunity and microbials to sustainable agriculture. **PI: A. Molina**. Funder: **Mosaic Company**. Budget: 25,000 €; Duration: 9/4/2021-31/12/2021.
6. Title: **MICROUWAS**. **PI: A. Molina**. Funder: **Valoriza Servicios Ambientales**. 115 k€. Duration: 30/10/2020-31/05/2024.

Patents: 1. Mérida, H., Rebaque, D., Jordá, L., del Hierro, I., Bacete, L., López, G., 1. Pérez, R., Brunner, F., and **Molina, A.** *Methods and composition to improve plant health and protection*. EP20383070 and (P19300EP02; 27/7/2020; 60% UPM/ 40% Plant Response Inc) and PCT/EP21/071085 (July 27th 2021). Licensed to Plant Response Inc (11/2021); 2. **Molina, A.**, Torres, M.A., Caro, E., Sacristán, S., Contreras, A.B., Blázquez, L. Del Pozo, C. *Métodos de extracción, a partir de diferentes fuentes de biomasa, de fracciones biológicas que activan respuestas fisiológicas de interés en plantas y su uso en cultivos para una producción agrícola sostenible*. Know-how registered as block chain. GEN-e1dd-c7b7-23cb-c7c9-0753-c077-2472-91ff, 21/10/2024 (Valtinum trust services). (75% UPM-25%CISC). Commercial license under negotiation with NDiscovery SL.

Entrepreneurship activity: Dr. **Molina** is co-founder of CBGP spin-off **Plant Response Biotech**, CBGP start-up **FAIR Data Systems** and NDiscovery SL (10/3/2024). NDiscovery SL has ensured an investment of 1,5 Millions € for the next 4 years.