

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	Miguel		
Family name	Verdú		
Gender (*)	Male	Birth date (dd/mm/yyyy)	11/03/1969
Social Security, Passport, ID number	20151652H		
e-mail	Miguel.Verdu@ext.uv.es	URL Web	www.uv.es/verducam
Open Researcher and Contributor ID (ORCID) (*)	0000-0002-9778-7692		

(*) *Mandatory***A.1. Current position**

Position	Profesor de Investigación		
Initial date	2021		
Institution	Consejo Superior de Investigaciones Científicas		
Department/Center	Ecología / Centro de Investigaciones sobre Desertificación		
Country	Spain	Teleph. number	96 1220540
Key words	Evolution of interactions, Plant Facilitation		

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

Period	Position/Institution/Country/Interruption cause
2008 - 2021	Investigador Científico / CSIC /Spain
2005 - 2008	Científico Titular / CSIC /Spain
2002 - 2005	Investigador contratado Ramón y Cajal MCyT / CSIC/Spain
1999 - 2002	Investigador contratado Reincorporación MEC / CSIC/Spain
1999 - 1999	Investigador contratado proyecto/ CSIC/Spain
1995 - 1998	Profesor Titular A / Universidad Nacional Autónoma de México

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
Doctor en Ciencias Biológicas	Universitat de València	1994
Licenciado en Ciencias Biológicas	Universitat de València	1992

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

Miguel Verdú received his doctorate in Biological Sciences in 1994 from the University of Valencia. He is currently a Research Professor at the CSIC at the Desertification Research Center (Valencia) and has teaching experience as a Full Professor at the National Autonomous University of Mexico. He has actively participated in scientific management, having been coordinator of the Plant and Animal Biology area of the National Agency for Evaluation and Prospective in the past and, currently, as coordinator of the Biodiversity Area of the State Research Agency. His line of research investigates how the evolutionary history of different lineages explains ecological interactions and the emergent properties that arise from them. Under this perspective, he has tracked the phylogenetic conservatism of various



types of ecological interactions throughout the tree of life, providing an excellent clue for predicting the assembly of communities. Among the ecological interactions that he has studied the most is facilitation between plants and his work has been a pioneer in identifying this interaction as one of the mechanisms that preserves the extinction of ancient lineages and promotes the phylogenetic diversity of communities. As a result of his research, he has published 143 articles in peer-reviewed journals (www.uv.es/verducam) that have been cited more than 7100 times. In addition, he has contributed to other 20 publications including books, book chapters and popular magazines. He has participated in outreach activities through talks at schools, radio interviews, and newspapers, as well as organizing courses for high school teachers. He has been the principal investigator of 6 international and 8 national projects and has advised 4 doctoral theses, all of them producing high level publications and promoting a successful scientific career for the doctorates. He has given 20 invited conferences in 8 countries, evaluated research projects for agencies in 5 countries, and reviewed articles for more than 50 journals. All this work has been the result of collaboration with 268 authors, which has allowed him to use tools and explore diverse disciplines such as population genetics, complex networks, community phylogenetics or artificial intelligence.

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

C.1. Publications (*see instructions*)

- 1.- Verdú, M., Alcántara, J.M., Navarro-Cano, J. A. & Goberna, M. 2023. Transitivity and intransitivity in soil bacterial networks. *The ISME Journal*, [17: 2135–2139](#)

In this article, we explain why pairwise interactions cannot depict competition correctly in complex communities, and propose an alternative through the detection of strongly connected components (SCCs) in microbial networks. We collected data on soil bacterial networks in plant ecosystems governed by facilitation where spatial heterogeneity may promote both transitive and intransitive competition. This approach represents a novelty in the study of bacterial interactions that have been usually analyzed in simple experiments without accounting for the complexity of natural communities. My contribution to this paper consisted of conceiving the idea, analyze the data and write the manuscript.

- 2.- Sánchez-Martín, R., Verdú, M., & Montesinos-Navarro, A. 2023. Phylogenetic and functional constraints of plant facilitation rewiring. *Ecology*, [e3961](#).

This article corresponds to the last PhD I supervised and shows different rewiring patterns of plant facilitation interactions as a function of the abiotic stress. I contributed to the experimental design, discussion of the results and reviewed the manuscript. The results are crucial to predict the fate of interactions in the face of future changes in environmental conditions.

- 3.- Verdú, M., Garrido, J.L., Alcántara, J.M., Montesinos-Navarro, A. et al. 2023. RecruitNet: A global database of plant recruitment networks. *Ecology*, [e3923](#).

This work represents an immense collaborative effort of more than 100 scientists around the world to characterize plant recruitment interactions across ecosystems. It provides an open and public database that will allow researchers to test ecological, biogeographical, and evolutionary hypotheses related to plant recruitment interactions. I conceived the idea, contacted the researchers, compiled the information and wrote the manuscript.

- 4.- Hirn J, García JE, Montesinos-Navarro A, Sanchez-Martín R, Sanz V, Verdú M. 2022. A Deep Generative Artificial Intelligence system to predict species coexistence patterns. *Methods in Ecology and Evolution*, [13: 1052-1061](#).

In this article, we (a group of physicists and ecologists) provide a Generative Artificial Intelligence model that is able to predict the species coexistence patterns in facilitation-driven ecosystems. All the disciplines are now using artificial intelligence and ecology is not an exception, but was mainly focused on image recognition and not in ecological predictions. The novelty of our manuscript is to apply the AI methods to unravel species coexistence patterns. I conceived the idea, discussed with the physicists and wrote the ecological part of the manuscript.

5.- Verdú, M., Gómez J.M., Valiente-Banuet, A. & Schöb, C. 2021. Facilitation and plant phenotypic evolution. *Trends in Plant Science*, [26: 913-923](#).

Here, we develop a theoretical eco-evolutionary framework based on fitness-trait functions and interaction effectiveness that provides predictions for how facilitation-related traits may evolve. The novelty is to demonstrate the potential of facilitation as an evolutionary selective force. I conceived the idea and wrote the manuscript.

6.- Navarro-Cano, J., Goberna, M., Valiente-Banuet, A. & Verdú, M. 2021. Phenotypic structure of plant facilitation networks. *Ecology Letters*, [24: 509-519](#).

In this paper we provide empirical evidence to support a long-lasting theoretical postulate stating that facilitation networks are phenotypically structured. Trait matching through which nurse and facilitated species avoid phenotypic overlap, and consequently competition, is the main linkage rule shaping plant facilitation networks. This work represents a step forward in the understanding of plant facilitation interactions at the community level, where all the complex interactions occur. I conceived the idea, analyzed the data and wrote the manuscript.

Navarro-Cano, J., Goberna, M., Verdú, M. 2019. Using plant functional distances to select species for restoration of mining sites. *Journal of Applied Ecology* [56: 2353-2362](#).

Here we encourage the use of ecological facilitation together with trait-based species selection to design restoration programmes based on the principle of increasing functional distance between target species. This study represents a useful link between theoretical ecology and restoration practices. I conceived the study and contributed to the final writing of the manuscript.

Montesinos-Navarro, A., Valiente-Banuet, A. & Verdú, M. 2018. Mycorrhizal symbiosis increases the benefits of plant facilitative interactions. *Ecography* [41:1-9](#).

We show, through meta-analytical techniques, that mycorrhizal fungi significantly enhance plant facilitative interactions, connecting thus disparate areas of plant ecology. I conceived the study, analyzed the data and wrote the manuscript.

Navarro-Cano, J.A., Goberna, M., Valiente-Banuet, A. & Verdú, M. 2016. Same nurse but different time: temporal divergence in the facilitation of plant lineages with contrasted functional syndromes. *Functional Ecology*, [30: 1854-1861](#).

We show that plant nursing abilities evolve ontogenetically in a different way for beneficiary Quaternary and Tertiary plant lineages. The finding of a plant species that plays a role as key assembler of early- and late-successional species in plant dynamics broadens the scope of facilitation in the community assembly theory. I conceived the study, analyzed the data and contributed to the final writing of the manuscript.

Valiente-Banuet, A., ..., Verdú, M., Zamora, R. 2015. Beyond species loss: the extinction of ecological interactions in a changing world. *Functional Ecology*, [29: 299-307](#).

This article represents a collaborative effort of a latin-american consortium of researchers showing that the extinction of interactions precedes to the extinction of species. It has received more than 800 cites. I contributed with the discussion of the idea and writing the manuscript.

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

Generative AI for Restoration Ecology. Conference on Artificial Intelligence and Ecosystem Management . Universidad de Valladolid. April 2023. Oral presentation.

Plant Facilitation Networks and Trait Evolution. 43rd New Phytologist Symposium. New Phytologist. 2019. Suiza. Invited Conference.

Plant Facilitation and Phylogenetics. XIV MEDECOS & XII AEET meeting. 2017. Spain. Keynote speaker.

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

Plant facilitation, biodiversity and ecosystem functioning. (CIPROM/2021/63). Programa Prometeo para grupos de investigación de excelencia de la Generalitat Valenciana. 01/01/2022-31/12/2025. 599.875 €. Principal Investigator.

Restauración Ecológica e Inteligencia Artificial (TED2021-129682B-I00) Proyectos Estratégicos orientados a la Transición Ecológica y Transformación Digital. 01/12/2022-30/11/2024. 218.500 €. Principal Investigator.

Interacciones entre interacciones (PID2020-113157GB-I00). Programa Estatal de I+D+i. Ministerio de Ciencia e Innovación. 01/09/2021-31/08/2024. 169.400 €. Principal Investigator.

Detección de rasgos vegetales y microbianos que dirigen la recuperación postincendio de funciones ecosistémicas (CGL2017-89751-R). Programa Estatal de I+D+i. Ministerio de Ciencia e Innovación. 01/2018-12/2020. 133.100 €. Principal Investigator.

Reactivación mediante facilitación de las funciones ecosistémicas en estructuras mineras que afectan a hábitats de interés comunitario. Fundación BBVA. I Convocatoria de ayudas de la fundación BBVA a proyectos de investigación. 12/2014-12/2016. 91.9745 €. Principal Investigator.

Ensamblaje de comunidades microbianas del suelo en ecosistemas gobernados por facilitación entre plantas (CGL2014-58333-P). Programa Estatal de I+D+i. Ministerio de Economía y Competitividad. 01/01/2015-31/12/2017. 175.450 €. Principal Investigator.