Dr. Juan Camilo Barbosa-Caro

PhD.
Botany,
Molecular Biology &
Electrophysiology

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Visit my page - https://jucbca.github.io/

Results-driven researcher and leader with strong background in plant physiology, computational tools, and science communication.

Passionate about sustainable food production through effective knowledge transfer and interdisciplinary collaborations.

Core competencies

- Plant stress physiology
- Project management
- Tissue culture
- Data-driven
- 3D designing
- Fluorescent microscopy
- Electronics
- Molecular biology
- Electrophysiology

Language proficiency

- Spanish
- English
- German
- Russian
- Italian

Computational skills

- Data base management
- Signal analysis
- Bioinformatics
- Scalable pipeline construction
- FAIR principles
- Statistics

Publications

Research
orcid.org/0000-0002-4101-6450

Codes
https://github.com/jucbca

3D designs
www.printables.com/@jucbca_1987625

Professional experience

Postdoctoral Researcher
Feb. 2025 - July 2025
Scientific research. Collaboration management. Scientific writing and reviewing. Personnel training and mentoring. Equipment maintenance and operation.
Heinrich Heine Universität, Düsseldorf - Germany

Research Scientist -
Sept. 2021 - Dec. 2024
Research project outline and execution for researching plant stress physiology. Contribution to grant writing.
Heinrich Heine Universität, Düsseldorf - Germany

Group coordinator -
Jan. 2022 - June 2022
Team leader for virtual learning material development for the 7th edition of the Plant Physiology book by Taiz & Zeiger.
Oxford University Press - Remote, Maryland - USA

Teaching assistant -
Aug. 2018 - Aug. 2021
Coordination and teaching of practical plant physiology and molecular biology courses.
University of Maryland, College Park - USA

Science coordinator -
Jan. 2016 - Sept. 2018
Coordination, negotiation, and representation functions in international science olympics competitions.
Universidad Antonio Nariño, Bogotá - Colombia

Education

PhD. in Plant Physiology
Sept. 2021 - May 2025
Heinrich Heine Universtät, Düsseldorf - Germany

MSc. in Plant Physiology
Aug. 2018 - August. 2021
University of Maryland, College Park, Maryland - USA

BSc. in Biology
Graduated Sept. 2017
Colombia National University, Bogota - Colombia

References

Dr. Michael Wudick
wudick@hhu.de
Heinrich Heine Universität
Düsseldorf - Germany

Prof. José Feijó
jfeijo@umd.edu
University of Maryland
College Park - USA

Prof. Wolf Frommer
frommew@hhu.de
Heinrich Heine Universität
Düsseldorf - Germany

Laboratory skills

Plant in vitro culture
- Protoplasting and regeneration of plant tissue
- Maintenance of cell suspension cultures

Mammalian cell culture
- Maintenance and transfection of cultured mammalian cells

Fungal culture
- Mycelium maintenance in solid and liquid media
- Scalable inoculus production
- Sevelopment of novel spawn mix
- Growth conditions automation - green house automation

Molecular biology
- DNA and RNA extraction for genotyping, sequencing, and cloning. CTAB, Edwards protocols
- DNA and RNA quality control with Qubit, Nanodrop, and biochemical assays
- Molecular cloning
- RNA in vitro synthesis and manipulation
- PCR and qPCR primer design, testing and optimization
- Manipulation and analysis of genomic sequencing data.

Electrophysiology
- patch-clamp in mammalian and protoplasted plant cells
- patch clamp in living brain slices
- plant cell impalement - current clamp
- Two-Electrode Voltage Clamp in Xenopus oocytes
- Multi-Electrode Array recording of surface potential plant tissues

Microscopy
- Strong conceptual comprehension of microscopy physical principles and functioning
- Bright field microscopy with optical contrast methods: phase contrast and differential interference contrast.
- ***In vivo*** fluorescence microscopy with genetically encoded reporters
- Confocal microscopy image acquisition and processing
- Super-resolution microscopy: PALM and STORM

Data analysis

Image analysis
- Image preprocessing: noise reduction, background substraction
- Multidimentional integration: time-lapse particle tracking, kinetic analysis, 3D stack reconstruction
- Quantification: pixel intensity measurements, co-localization, ROI segmentation
- Pipeline automation: build scalable, reproducible workflows for large datasets

Signal analysis
- Signals preprocessing: filtering, drift substraction, baseline offset
- Signal transformation: Fast Furier Transform, Independent Component Analysis, Principal Component Analysis
- Signal kinetic analysis: event identification and quantification, function and model fitting, nonlinear regression

Data analysis
- Data wrangling and cleaning of datasets
- Data exploration and visualization - R-ggplot, Rshiny, python-matplotlib
- Data governance - strong commitment to FAIR principles

Statistics
- Data exploration, pattern identification
- Model building and parameter estimation: Bayesian, linear models
- Hypothesis testing: parametric and non-parametric tests

Talks & Conferences

Open talk, Düsseldorf, Germany May 2025
Integrative investigation of long-distance electric signaling in plants: a spatial, analytical and optogenetic dissection.
Open Doctoral Defense - Heinrich Heine University

Poster presentation, Lisbon, Portugal July 2024
Enhance analytic and spatio-temporal resolution of the wound-induced Slow Wave Potential.
Plant Calcium Signaling Conference - EMBO Workshop

Poster presentation, Milan, Italy July 2022
Kinetic dissection of wound-induced calcium signals in roots.
Plant Calcium Signaling Conference - University of Milan

Poster presentation, Bonn, Germany August 2022
Kinetic dissection of wound-induced calcium signals in roots.
Botanik-Tagung - German Botanical Society

Open talk, Düsseldorf - Germany February 2022
Investigating the mechanisms of electric signaling in plant
Collaborative Research Center 1208 - Heinrich Heine University,

Scientific Writing

Barbosa-Caro JC., Dar AM, Atanjaoui F, Burkart RC, Guo H, Gao S, Nagel G, Stavrinidou E, Wudick MM. (Submitted, 2025)
Optogenetic and spatial dissection of calcium and electrical excitability in plant systemic wound signaling.

Atanjaoui F, Kleist T, **Barbosa-Caro JC**, Wudick MM. (2025)
A detailed guide to recording and analyzing Arabidopsis thaliana leaf surface potential dynamics elicited by mechanical wounding. ***Bio-protocol***

Barbosa-Caro JC, Wudick MM. (2024)
Revisiting plant electric signaling: Challenging an old phenomenon with novel discoveries. ***Current Opinion in Plant Biology.***

Contribution to Grant proposal Collaborative Research Centre 1208. (2023)
Indentity and dynamics of membrane systems - From molecules to cellular functions. Heinrich Heine University, Düsseldorf

Green MN., Shanti P G., Michard E., Simon AA., Portes MT., **Barbosa-Caro JC.**, Wudick MM., Lizzio MA., Klykov O., Yelshanskaya MV., Feijó JA., Sobolevsky AI. (2021)
Structure of the Arabidopsis thaliana glutamate receptor like channel GLR3.4. ***Molecular Cell.***

Relevant Workshops & Courses

Project management in science
Heinrich Heine University, Germany
Negotiation, prioritization, and organization of tasks for effective project design and execution in the context of scientific research.

Project management
Cámara de comercio, Bogotá, Colombia
To know and correctly apply the stages for managing a project based on the best practices of the PMBOK Guide.

Statistics and Modelling for Biology
Prof. Phillip Johnson
University of Maryland, USA
Probability theory, statistical inference, and hypothesis testing with likelihood , Bayesian methods and other statistical test. Hands on course usign the software R.

Programming for Biology
Prof. Steve Mount,
Prof. Najib El-Sayed
University of Maryland, USA
Manipulation and analysis of large genomic data files in a unix environment using awk, python and R

Teaching & Mentoring

Lecturing
Lecture preparation and course development in a modern pedagogical dogma, following Bloom's taxonomy. Focused on molecular biology and physiology at university level.

Practical laboratory teaching
Preparation of laboratory practices in molecular biology, plant physiology and bioinformatics following existing protocols. Material acquisition, inventory management, teaching assistants training, and student guidance.

Scientific Mentoring
Mentoring of bachelors, masters, doctoral students, and postdocs. Guidance provided in data analysis, programming, and laboratory technics. Also scientific thinking and writing.