Paulo Izquierdo

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EDUCATION

2017- present **Ph.D. Degree**, Michigan State University, Plant Breeding Genetics and Biotechnology, Dissertation Title: "Exploring the genetic architecture and improving genomic prediction accuracy for yield, mineral concentration, and canning quality traits in common bean."

2010 **B.S. Degree**, Universidad del Tolima, with Distinction, Biology, Thesis title: "Use of the advanced backcross-QTL method to transfer seed mineral accumulation nutrition traits from wild to Andean cultivated common beans."

RESEARCH AND PROFESSIONAL EXPERIENCE

09/2022 – present **Graduate research assistant.** Dissertation Title: Exploring the genetic architecture and improving genomic prediction accuracy for yield and end-use quality traits in common bean. Michigan State University.

06/2022 – 08/2022 **Quantitative Genetics / Computational Biology Intern.** Use of machine learning models to identify potential targets for genome editing. INARI.

01/2017 – 05/2022 **Graduate research assistant.** Dissertation Title: Exploring the genetic architecture and improving genomic prediction accuracy for yield and end-use quality traits in common bean. Michigan State University.

06/2016 – 12/2016 **Visiting Scholar.** Development of molecular markers linked to anthracnose resistance in common bean. Michigan State University.

09/2013 – 06/2016 **Research assistant.** Fine-mapping of QTLs associated with minerals concentration in common bean and Genome-wide association mapping for agronomic traits in a Multiparent Advance Generation Intercross population. CIAT.

01/2011 – 08/2013 **Research assistant.** QTL analysis and chloroplast transformation in sugarcane. Colombian Sugarcane Research Center (Cenicaña).

07/2010 – 12/2010 **Visiting researcher.** Use of molecular marker assisted selection for resistance to anthracnose in common bean. CIAT/Universidad Nacional de Colombia.

01/2009 – 06/2010 **Undergraduate Research Assistant.** Use of the advanced backcross-QTL method to transfer seed mineral accumulation nutrition traits from wild to cultivated common beans. CIAT.

PUBLICATIONS

1. **Izquierdo, P**; Kelly, J; Cichy, K. Accelerating genetic gain in dry beans for yield and end-use quality traits using genomic selection and high-throughput phenotyping. **In preparation.**
2. **Izquierdo, P**; Beebe, S; Kelly, J and Cichy, K. Meta-QTL and ortho-MQTL analyses for yield and yield components in dry bean. **Submitted.**

3. Sadohara, R; **Izquierdo, P**; Alves, F; Porch, T; Beaver, J; et al. The *Phaseolus vulgaris* Yellow Bean Collection: Genetic diversity and characterization for cooking time. Genet. Resour. Crop. Evol. **2022**
4. Sadohara, R; Long, Y; **Izquierdo, P**; Urrea, C; Morris, D and Karen Cichy. Seed Coat Color Genetics and G×E in a Yellow Bean Collection via Image Analysis Paired with Machine-Learning and GWAS. The Plant Genome. **2021.**
5. Diaz, S; Ariza-Suarez, D; **Izquierdo, P**; Lobaton, JD; de la Hoz, JF; et al. Genetic mapping for agronomic traits in a MAGIC population of common bean (Phaseolus vulgaris L.) under drought conditions. BMC Genomics. **2020.**
6. Berry, M; **Izquierdo, P**; Jeffery, H; Shaw, S; Nchimbi-Msolla, S and Cichy, K. QTL analysis of cooking time, seed attributes, and protein concentration in a recombinant inbred dry bean (*Phaseolus vulgaris* L.) population grown in two agro-ecological zones in Tanzania. Theor. Appl. Genet. **2020.**
7. **Izquierdo, P**; Astudillo, C; Blair, M; Iqbal, A; Raatz, B and Cichy, K. Meta-QTL analysis of seed iron and zinc concentration in common bean (*Phaseolus vulgaris* L.) Theor. Appl. Genet. **2018.**
8. **Izquierdo, P**; Shaw, S; Berry, M and Cichy K. A saturated genetic linkage map of common bean (*Phaseolus vulgaris* L.) developed using Genotyping by Sequencing (GBS). Annual report of the Bean improvement cooperative. **2017**.
9. Perea, C; De la Hoz, J; Cruz, J; Lobaton, J; **Izquierdo**, P, et al. Bioinformatic analysis of genotype by sequencing (GBS) data with NGSEP. BMC Genomics. **2016.**
10. Blair, M; **Izquierdo, P**; Astudillo, C and Grusak, M. A. Legume Biofortification Quandary: Variability and genetic control of seed coat micronutrient accumulation in common beans. Front. Plant Sci. **2013.**
11. Delgado, H; Pinzón, E; Blair, M and **Izquierdo, P.** Evaluation of bean (*Phaseolus vulgaris* L.) lines result of an advanced backcross between a wild accession and Radical Cerinza. U.D.C.A Act. & Div. Cient**. 2013**.
12. **Izquierdo, P**; A. Gutiérrez; J.I. Victoria; M.C. Ángel and J. López: Molecular markers associated with resistance to Sugarcane yellow leaf virus. Proceedings International Society Sugar Cane Technologists. **2013**.
13. Blair, M and **Izquierdo, P**. Use of the advanced backcross-QTL method to transfer seed mineral accumulation nutrition traits from wild to Andean cultivated common beans. Theor. Appl. Genet. **2012.**
14. Blair, M; **Izquierdo, P**; Astudillo, C; Monserrate, F; Cortés, M, et al. Utilization of near infrared spectrophotometry (NIRS) analysis for evaluation of mineral content in Andean bean samples. Annual report of the Bean improvement cooperative. **2011**.

ORAL AND POSTER PRESENTATIONS

1. **Izquierdo, P**; Lopez, M; Kelly, J; Cichy, K. Assessing Genomic Selection Prediction Accuracy for Yield and End-Use Quality Traits in Black Beans. Bean improvement cooperative. **Poster. 2019.**
2. **Izquierdo, P**; Katuuramu, D; Cichy, K. Genomic selection for nutritional traits and cooking time in common bean) using Genotyping by Sequencing. Plant & Animal Genome. **Poster. 2019.**
3. **Izquierdo, P**; Astudillo, C; Iqbal, A; Blair, M; Raatz, B and Cichy, K. Meta-QTL Analysis in Common Bean to Uncover the Genetic Architecture of Iron and Zinc Concentration in Seed. Plant & Animal Genome. **Poster. 2018.**
4. **Izquierdo, P**; Shaw, S; Berry, M and Cichy K. A saturated genetic linkage map of common bean developed using Genotyping by Sequencing (GBS). Bean improvement cooperative. **Poster. 2017.**
5. **Izquierdo, P**; Lobaton, J; Mayor, V; Grajales, M; Cajiao, C; Duitama, J and Raatz, B. Genome-wide association mapping for yield and other agronomic traits in a Multi-parent advanced generation inter-

cross population of Mesoamerican common bean *(Phaseolus vulgaris L.)*. IX Latin American and Caribbean Agricultural and Forestry Biotechnology Meeting, Peru. **Oral presentation. 2016.**

6. **Izquierdo, P**; Gutiérrez, A; Victoria, J; C; Ángel, López, J; Avellaneda, C. Molecular markers associated with resistance to the sugarcane yellow leaf virus. XXVIII International Society of Sugarcane Technologists (ISSCT). Brazil. **Oral presentation. 2013.**
7. **Izquierdo, P**; Gutiérrez, A; Victoria, J; Ángel, J; López, J; Avellaneda, C. Molecular markers associated with resistance to the sugarcane yellow leaf virus. IX Association for Sugarcane Technology in Latin America and the Caribbean (Atalac-Tecnicaña). Colombia**. Oral presentation. 2012.**
8. **Izquierdo, P**; Gutiérrez, A; Avellaneda, C; Victoria, J; Ángel, López, J. Molecular markers associated withresistance to the sugarcane yellow leaf virus. Colombian and Latin American Phytopathological Association. Colombia. **Oral presentation. 2011**.

HONORS, AWARDS, AND FELLOWSHIPS

2022 Norman and Jessie Thompson fellowship in Crop and Soil Sciences.
2021 NSF Research Traineeship – Integrated training model in plant and computational sciences fellowship.
2021 Everett and Jane Everson fellowship in Plant Breeding.
2021 Jason and Dana Lilly fellowship in Plant Breeding, Genetics & Biotechnology.
2021 Norman and Jessie Thompson fellowship in Crop and Soil Sciences.
2021 College of Agriculture and Natural Resource fellowship, Michigan State University.
2020 Bayer Diversity Initiative Scholar.
2019 Everett and Jane Everson fellowship in Plant Breeding.
2019 Norman and Jessie Thompson fellowship in Crop and Soil Sciences.
2019 Graduate student language fellowship in undergraduate teaching and learning Residential College in the Arts and Humanities, Michigan State University.
2019 Council of graduate students, Conference Award, Michigan State University.
2018 The Crop and Soil Science Graduate award, Michigan State University.
2018 Jason and Dana Lilly fellowship in Plant Breeding, Genetics & Biotechnology.
2018 Elmer C. Rossman fellowship in Plant, Soil & Microbial Science.
2018 Everett and Jane Everson fellowship in Plant Breeding.
2018 Resilient and Nutritious dry beans for Africa fellowship, USDA-FAS.
2017 Doctoral Fellowship Program. COLCIENCIAS, Colombia's Administrative Department of Science, Technology, and Innovation.

PEDAGOGICAL EXPERIENCE & MENTORING

2021 Workshop Instructor: Quantitative Genetics, Feed the Future Innovation Lab for Crop Improvement, Eastern Africa.
Website: https://pauloizquierdo.github.io/Quantitative_Genetics/

2021 Workshop Co-Instructor: Data visualization with R, Industrial University of Santander, Colombia.
Website: https://compasscol.github.io/dataviz/

2021 Workshop Co-Instructor: Introduction to R, Industrial University of Santander, Colombia.
Website: https://compasscol.github.io/IntroR/

2019 Spanish Language Assistant: Residential college in the arts and humanities, program on sustainability in Costa Rica, Michigan State University.

2019 Teaching assistant: Department of plant, soil and microbial sciences, Introduction to plant genetics (CSS350), Michigan State University

2018 As a research assistant, I mentored an USDA Borlaug fellow in lab-based research. Michigan State University. Trainee: Winnyfred Amongi.

2016-2015 As a research assistant, I mentored 2 undergraduates in greenhouse and lab-based research, CIAT. Trainees: Wilson Santiago, Laura Paz.

SYNERGISTIC ACTIVITIES

2021 Co-Organizer, Workshops series focused on data analysis in biology and agriculture. Industrial University of Santander, Colombia.
Website: https://compasscol.github.io/2021B_talleres-UIS.html

2021 Co-Organizer, Online seminar series on phytopathology and plant breeding. University of Nariño, Colombia.
Website: https://compasscol.github.io/2021A_Conferencias-UNar.html

2020 Co-Founder, Community Platform for Agricultural Sciences (COMPASS). Website: https://compasscol.github.io/

2020 Co-Organizer, Online science: promoting the use of platforms for scientific dissemination, collaboration, and inspiration, SOCOLEN symposium. Colombia.

2019 Co-Organizer, Phenomic Application in Plant Breeding, Corteva-PBGB symposium. Michigan State University.

MEMBERSHIPS

Bean Improvement Cooperative
American Society of Agronomy
Crop Science Society of America
Soil Science Society of America

REFERENCES

Dr. Karen Cichy	USDA-ARS adjunct associate professor Michigan State University; Department of Plant, Soil and Microbial Sciences karen.cichy@usda.gov
Dr. Carlos Galeano	Senior Scientist Crop Genetics BASF carlos.galeano@vegetableseeds.basf.com
Dr. Bodo Raatz	Prebreeder Limagrain bodoraatz@gmail.com