Marco Antônio de Amorim Peixoto

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Summary

Creative and self-driven scientist with strong theoretical and applied expertise in quantitative genetics, genomic selection, breeding program simulation, and linear mixed models. Skilled in leveraging statistical methods and genetic data to generate actionable insights for advancing genetics and breeding strategies.

Education background

- **Ph.D. in Genetics and Breeding.** Federal University of Viçosa – Brazil (2019-2023).
  Dissertation: Applying quantitative genetics tools to breeding program optimization.

- **M.Sc. in Animal Biology.** Federal University of Viçosa – Brazil (2014-2016).
  Thesis: Biogeography and conservation of the anurofauna in the Mantiqueira mountain range.

- **B.S. in Biological Science.** Federal University of Viçosa – Brazil (2009-2014).

Experience

2024-present – Associated researcher – Quantitative Genetics at Sweet Corn and Potato Breeding and Genomics Lab. University of Florida, USA. Supv. by Dr. Márcio Resende.
- Designed mate allocation strategies for breeding crosses with a focus on non-additive effects in clonal crops.
    - Development of optimization algorithms incorporating an inbreeding rate constraint.
- Deployed a genomic selection model within the Sweet Corn Breeding program.
    - Conducted genetic data analyses (spatial modeling, estimation/prediction of BLUE/BLUP).
    - Performed SNP/genotype calling and imputation using whole-genome sequencing and array data.
    - Development and calibration of a genomic selection model.
- Implemented and developed statistical methods to leverage G×E interaction for potato recommendation.
    - Deployment of environmental covariate models for the recommendation of potato varieties.
- Mentored students on quantitative genomics analyses and breeding-driven projects.

2023-2024 - Postdoctoral associate at Sweet Corn and Potato Breeding and Genomics Lab. University of Florida, USA. Supv. by Dr. Márcio Resende.
- Mate allocation of breeding crosses, via package development (SimpleMating package).
- Performed GWAS analyses for discovery breeding of traits in the Sweet Corn and the Potato breeding programs.
- Developed an imputation pipeline for low-density marker data in the Sweet Corn panel.
- Designed and deployed a genomic selection pipeline via stochastic simulations for potato improvement.
- Mentored students on quantitative genomics analyses and breeding-driven projects.

2021-2023 - Visiting Research Scholar at Sweet Corn and Potato Breeding and Genomics Lab. University of Florida, USA. Supv. by Dr. Márcio Resende.
- Planning and optimization of the sweet corn breeding program via stochastic simulations.
- Hybrid prediction under G×E interaction for recommendation purposes in multi-trait scenarios.
- Development of cross-prediction (mean, variance, and usefulness) algorithms and mate allocation optimization.
- Multidisciplinary activities through cross-functional teams.
    - Functional biology: Identification GWAS hits for posterior functional identification.
    - Evolutionary biology: Modelling, prediction/estimation of BLUEs/BLUPs and heritabilities for evolutionary studies.
- Nursery activities at the sweet corn breeding program (phenotyping, selfing, crossing, and selection).

2021-2022 - Scientific coordinator, at GenMelhor. Federal University of Viçosa, Brazil.
- Coordination of the scientific sector of the study group, with emphasis on the promotion of events for the students from the genetics and breeding program and related areas.
- Working collaboratively with the team for symposiums, workshops, and short courses organization for students.

2019-2023 - Graduate research assistant at Biometry Lab. Supv. by Dr. Leonardo L. Bhering. Federal University of Viçosa.
- Development of statistical genetics approaches for genetic evaluation with emphasis on modeling, prediction, and selection via mixed models.
- Teaching short courses on mixed models, statistics, and plant breeding to companies, students, and professionals.
- Working collaboratively on the discussion and implementation of genetic assessment and breeding.

2016-2017 - Teaching Assistant. Institute of Technology of Minas Gerais State, Brazil
- Teaching classes for undergrads students from Agronomy and correlated areas.

2014-2016 - Graduate research assistant at Biological Data Analysis Lab. Supv. Dr. Pedro S. Romano. Federal University of Viçosa, Brazil.
- Definition of singular areas in species distribution from the Mantiqueira mountain range region as surrogates to define target areas for conservation and protection.

2012-2014 - Fellowship intern, at Molecular Biology Lab. Federal University of Viçosa, Brazil.
- Development of molecular methods for genome sequencing and cytogenetics studies.
- Description of karyotypes of species and populations through classic and molecular techniques.

Skills

Computational:
- Advanced R programming and related tools (Markdown/Quarto, Shiny, Tidyverse).
- Background on parallel computing (linux), Git version control system (GitHub), and commercial software (*i.e.* ASReml, BLUPF90 family, DSSAT).
- Basic coding in C++ (Rcpp Eigen/Armadillo), Python, shell/bash, LaTeX, and VCFtools/BCFtools.
- Background on marker data imputation programs: BEAGLE, AlphaPlantImpute2, and Impute5.

Key-areas of expertise:
- Plant genetics and breeding: field breeding techniques, selection theory, and breeding program simulations (stochastic process).
- Quantitative genetics, Mixed models, Multivariate models, and Bayesian methods.
- Software development using R coding with R Shiny app interface.
- Imputation methods based on hidden Markov models.
- Genome-wide association, genetic evaluation, genome-wide prediction methods, cross-prediction, and mate-pair allocation.
- Phenomics (NIR-based methods) and environmic-based prediction models.

Awards and Recognitions
- 1st place: Larry Darrah Student presentation contest (best oral presentation). Corn breeding and research meeting (2023), Saint Louis, Missouri, USA.
- 1st place: best dissertation in Genetics and Breeding. Federal University of Viçosa (2023). Viçosa, Minas Gerais, Brazil.
- PrInt-CAPES scholarship (1st place - 2021). Federal University of Viçosa. Viçosa, Minas Gerais, Brazil.

Publications

Software

- **SimpleMating**: R package for breeding crosses prediction and optimization. Access: https://github.com/Resende-Lab/SimpleMating

Teaching and short talks

- Teaching assistant of Quantitative Genetics, graduate level, University of Florida (2024).
- Short course in 'Multi-Omic integration for AI Genomic Prediction Breeding'. University of Florida (2024).
- Short course in "Optimization of breeding programs via simulations and genomic selection", Federal University of Vicosa (2024).
- Short course in 'Breeding Programs simulations,' University of Florida (2023).
- Teaching assistant of 'Molecular markers applied to plant breeding', graduate level, University of Florida (2023).
- Short course in 'Multi-Omic integration for AI Genomic Prediction Breeding'. University of Florida (2023).
- Teaching assistant of Quantitative genetics, graduate level, University of Florida (2022).
- Guest lecture "Artificial intelligence in the big data era: insights and applications", Federal University of Juiz de Fora (2021).
- Short course in Spatial statistics applied to plant breeding, Federal University of Viçosa, Brazil (2020).
- Short course in experimental statistics applied to plant breeding, CMPC company, Brazil (2020).
- Short course in mixed models applied to plant breeding, Sistemas integrados Florestais, Brazil (2020).
- Teaching assistant of experimental statistics, graduate level, Federal University of Viçosa, Brazil (2020).

Selected publications

- Graciano, R, <u>Peixoto, MA</u>**,** Leach, K, Gustin, J, Settles, M, Armstrong, P, Resende, M. (2025). Integrating Phenomic Selection Using Single-Kernel Near-Infrared Spectroscopy and Genomic Selection for Corn Breeding Improvement. Theoretical and Applied Genetics. 2025.
- <u>Peixoto, MA</u>, Amadeu RR, Bhering, LL, Munoz, PR, Ferrao, LF, Resende, M. SimpleMating: R-package for prediction and optimization of breeding crosses using genomic selection. The Plant Genome. 2024.
- <u>Peixoto, MA,</u> Coelho, I, Leach, K, Lubberstedt, T, Bhering, LL, Resende, M. (2024). Use of simulation to optimize a sweet corn breeding program: implementing genomic selection and doubled haploid technology. G3: Genes|Genome|Genetics.
- <u>Peixoto, MA</u>, Leach, K, Jarquin, D, Flannery, P, Zystro, J, Tracy, W, Bhering LL., Resende, M. (2024). Utilizing genomic prediction to boost hybrid performance in a sweet corn breeding program. Frontiers in Plant Science.
- <u>Peixoto, MA</u>, Coelho, I, Leach, K, Bhering, LL, Resende, M. (2023). Simulation-Based Decision Making and Implementation of Tools in Hybrid Crop Breeding Pipelines. Crop Science.
- Evangelista J, <u>Peixoto, MA</u>, Coelho I, Ferreira F, Marçal T, Alves R, Chaves S, Rodrigues E, Laviola B, Resende M, Dias K, Bhering L. (2023). Modeling covariance structures and optimizing Jatropha curcas breeding. Tree Genetics & Genomes.
- Malikouski R, Alves R, <u>Peixoto MA</u>, Ferreira F, do Nascimento E, de Morais A, Zucoloto M, Dias K, Bhering L. (2023). Selection index based on random regression model in 'Tahiti' acid lime. Euphytica.
- Santos I, <u>Peixoto MA</u>, Cruz C, Ferreira R, Nascimento M, Rosado R, Sant'Anna I. (2022). A novel approach to determine tropical persistence on alfalfa germplasm. Agronomy Journal.
- Marinho C, Coelho I, <u>Peixoto MA,</u> Junior G, Resende M. (2022). Genomic Selection As A Tool For Maize Cultivars Development. Revista Brasileira De Milho E Sorgo.
- Ferreira F, Rodrigo V, Malikouski R, <u>Peixoto MA</u>, Bernardeli A, Alves R, Magalhães-Jr W, Andrade R, Bhering L, Machado J. (2021). Bioenergy Elephant Grass Genotype Selection Leveraged by Spatial Modeling of Conventional and High-Throughput Phenotyping Data. Journal of Cleaner Production.
- Silva L. <u>Peixoto MA</u>, Peixoto L. Romero J, Bhering L. (2021). Multi-Trait Genomic Selection Indexes Applied to Identification of Superior Genotypes. Bragantia.
- <u>Peixoto MA</u>, Coelho, I, Evangelista J, Santos S, Alves R, Pinto J, Reis E, Bhering L. (2021). Selection of Maize Hybrids: An Approach with Multi-Trait, Multi-Environment, and Ideotype-Design. Crop Breeding and Applied Biotechnology.
- Coelho I, <u>Peixoto MA</u>, Marçal T, Bernardeli A, Alves R, De-Lima R, Reis E, Bhering L. (2021). Accounting for Spatial Trends in Multi-Environment Diallel Analysis in Maize Breeding. Plos One.
- Evangelista J. <u>Peixoto MA</u>, Coelho I, Alves R, Laviola B, Fonseca-e-Silva F, Resende M, Silva F, Bhering L. (2020). Environmental Stratification and Genotype Recommendation Toward the Soybean ideotype: A Bayesian Approach. Crop Breeding and Applied Biotechnology.
- <u>Peixoto MA</u>, Alves R, Coelho I, Evangelista J, Resende M, Carvalho J, Fonseca-e-Silva F, Laviola B, Bhering L. (2020). Random Regression for Modeling Yield Genetic Trajectories in *Jatropha curcas* Breeding. Plos One.
- **See all publications at my website:** https://marcopxt.github.io/publications/

References

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