

**Nathan J. Fumia**  
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## Education

University of Hawai'i at Mānoa, Honolulu, HI

**2021-2024**     *PhD in Tropical Plant and Soil Sciences with Focus in Plant Breeding and Genetics*  
Dissertation: Breeding Scheme Development: Neo-Domestication  
*Relevant Courses:* Advanced Biometry (ZOOL 632), Population Genetics (BIOL 650)

University of Hawai'i at Mānoa, Honolulu, HI

**2019-2021**     *M.Sc. in Tropical Plant and Soil Sciences with Focus in Plant Breeding, Minor in Ecology, Evolution, and Conservation Biology*  
Thesis: Exploring Potato Crop Wild Relatives for use in Breeding  
*Relevant Courses:* Systematics and Phylogenetics (PEPS 662), Concepts of Genetics (TPSS 371), 3D Mapping and Analysis (GEOG 471), Communications in the Sciences (TPSS 654), Experimental Design (TPSS 603), Quantitative Plant Breeding (TPSS 699), Biometry (ZOOL 631), Quantitative Genomics and Evolution (TPSS 615), Advanced Statistics in R (OCN 683), Conservation Biology (BOT 690)

California Polytechnic State University, San Luis Obispo, CA

**2011-2015**     *B.S. in Agricultural Business with Focus in Plant Protection Science.*  
• Overall Cal Poly GPA - 3.2/4.0  
• Dean's List: Spring 2013, Spring 2015  
*Relevant Courses:* Forage crops (CRSC 123), World of Chemistry (CHEM 110), General Botany (BOT 121), Weed Biology and Management (PPSC 321), Agricultural Entomology (PPSC 311), California Fruit Growing (FRSC 230), Irrigation Water Management (BRAE 340), Insect Pest Management (PPSC 431), Plant Pathology (BOT 323), Beekeeping (FRSC 123)

## Additional Training

**2022**     Navigating Tough Conversations in Statistical Collaboration; Drs. Emily Griffith and Julia Sharp; University of Hawaii at Manoa, Honolulu, Hawaii; August 30, 2022

**2022**     Genomewide Markers in Plant Breeding; Dr. Rex Bernardo; University of Minnesota, Minneapolis-Saint Paul, Minnesota; June 22-24, 2022

**2022**     Data Bootcamp for Genomic Prediction in Plant Breeding; Dr. Aaron Lorenz; University of Minnesota, Minneapolis-Saint Paul, Minnesota; June 20-22, 2022

**2022**     Tools for Genomics-Assisted Breeding in Polyploids; Dr. David Byrne, Dr. Oscar Riera-Lizarazu, & Dr. Jeffrey Endelman; San Diego State University, San Diego, California; January 13-14, 2022

**2021**     26<sup>th</sup> Summer Institute in Statistical Genetics (SISG): Mixed Models in Quantitative Genetics; Dr. Bruce Walsh & Dr. Guilherme Rosa; University of Washington, Seattle, Washington; July 7-23, 2021

- 2020** Tucson Plant Breeding Institute: Module 1 (Introduction to Plant Quantitative Genetics) & Module 2 (Advanced Statistical Plant Breeding); Dr. Bruce Walsh, Dr. Mike Gore, Dr. Lucia Gutierrez; University of Arizona; January 6-10, 2020
- 2016** Oregon State University, Online  
Course: Genes & Chemical Value & Risk (BI 435)
- 2016** Hartnell College, Salinas, CA  
Courses: Fertilizers & Plant Nutrition (ABT-98), Vegetable Crop Production (ABT-96)
- 2016** Yuba Community College, Online  
Courses: General Biology (BIOL-10), General Biology Lab (BIOL-11)

### Fellowships and Scholarships

- 2020-Present** HARC-HSPA Sustainable Agriculture Fellow  
*Advisor – Tyler Jones (808) 927-7508; Hawaii Agricultural Research Center, Waipahu and Kailua, HI*
- Stevia (*Stevia rebaudiana*) breeding program to improve population performance and identify new varieties with improved flowering time, steviol glycosides content, and overall productivity
  - Breeding program optimization through quantitative genetics analysis for crossing in koa (*Acacia koa*) and evaluation in cacao (*Theobroma cacao*)
- 2022-2023** James L. Brewbaker Endowed Fellow  
*Advisor – Dr. Michael Kantar; University of Hawai'i at Mānoa, Honolulu, HI*
- 2021-2022** James L. Brewbaker Endowed Fellow  
*Advisor – Dr. Michael Kantar; University of Hawai'i at Mānoa, Honolulu, HI*
- 2021-2022** Haruyuki Kamemoto Scholarship  
*Advisor – Dr. Michael Kantar; University of Hawai'i at Mānoa, Honolulu, HI*

### Peer Reviewed Publications

1. Pironon, S., Borrell, J.S., Ondo, I., Douglas, R., Phillips, C., Khoury, C.K., Kantar, M.B., **Fumia, N.**, Soto Gomez, M., Viruel, J., Govaerts, R., Forest, F., Antonelli, A. (2020). Toward Unifying Global Hotspots of Wild and Domesticated Biodiversity. *Plants*, 9, 1128.
2. Del Valle-Echevarria, A., **Fumia, N.**, Gore, M. A., & Kantar, M. (2021). Accelerating Crop Domestication in the Era of Gene Editing. *Plant Breeding Reviews, Volume 45*, 185.
3. **Fumia, N.**, Pironon, S., Rubinoff, D., Khoury, C. K., Gore, M. A., & Kantar, M. B. (2022). Wild relatives of potato may bolster its adaptation to new niches under future climate scenarios. *Food and Energy Security*, <https://doi.org/10.1002/fes3.360>.
4. **Fumia, N.**, Rubinoff, D., Zenil-Ferguson, R., Khoury, C.K., Pironon, S., Gore, M.A., Kantar, M.B. (2022). Interactions between breeding system and ploidy affect niche breadth in Solanum. *R. Soc. Open Sci.* 9: 211862. [doi.org/10.1098/rsos.211862](https://doi.org/10.1098/rsos.211862)

### Research Experience

Advisor – Tyler Jones

- Management of stevia (*Stevia rebaudiana*) conventional breeding in controlled environment, biochemical analysis of steviol glycosides, statistical analysis of parental breeding lines' trait heritability
- Development of standard operating procedures for papaya clonal propagation of elite varieties in greenhouse environment
- Comparative trial management of greenhouse seed oil production of dwarf varieties of sunflower (Pioneer) and rapeseed (Pioneer and Essex)
- Augmented randomized complete block design development and implementation to analyze phenotypic variation in 500 new stevia varieties across 2 environments
- Germplasm maintenance of stevia, koa, papaya, taro, and ti in controlled environment
- Disease resistance testing and trial in koa seed source along the spectrum of wild to developed
- Harvest trait analytics on cacao varieties along the spectrum of landrace to hybrids
- Development of controlled environment system for experimental trial and high-throughput phenotyping of stevia varieties

Advisor – Dr. Michael Kantar

- Potato Wild Relative Research: phylogenetic inferences; occurrence data analysis; climate projection analysis; regression analysis of biological, evolutionary, and ecological factors
- Variety selection with multispectral data: cooperation on Genome-2-Phenome project with World Vegetable Center; high-dimensional data organization and analysis; new methods for selecting pepper varieties for increased temperature resistance; k-means clustering and random forest modelling for anomaly analysis; genomic selection for genotype performance

## **Professional Experience**

Horticultural Specialist/ Customer Success (July 2020 – Present)

*Advisor – John Allen (206-551-3392); iUNU, Inc., North America Operations*

- Data analysis, crop model comparison, & reporting for iUNU customers via Luna camera view & customer SOPs
- New product development to rapidly identify insects and output IPM related protocols for client

Principal (April 2018 – Present)

*Greenhouse and Field Crop Production Consulting Service; Higher Plants Consulting, LLC., United States Operations*

- Advise agricultural and horticultural clients maximizing productivity
- Specializing in best management practices, plant fertility, integrated pest management, controlled environment manipulation

Greenhouse and Field Research Assistant (September 2019 – January 2020)

*Advisor – Tyler Jones (808) 927-7508; Hawaii Agricultural Research Center, Waipahu and Kailua, HI*

- Design greenhouse retrofitting and implement standard operating procedures for a research greenhouse at Waipahu Research Site
- Assist with research as needed in greenhouse and field

Greenhouse Production Manager (December 2016 – June 2019)

*Advisor – John Allen (206-551-3392); Palomar Works and The Proving Grounds, San Diego, CA*

- Design of fertilizer and integrated pest management programs, soil media formulation and mixing, irrigation system design, environmental control software programming and oversight.
- Format operational structure and oversight of implementation.
- New varietal investigation and selection through data driven decision-making (yield, quality, stress resistance).

Crop Consultant and Trial Supervisor (August 2015 – November 2016)

*Advisors – Paul Maxwell (831-367-9221) and Doug Barnes (831-763-4533); Crop Production Services, Hollister and Watsonville, CA*

- Plant fertility and pest control diagnosis and recommendations.
- Design, conduct, and analysis of field and tree crop fertility and pest control research trials.
- Leaf tissue and soil sample analysis.

Co-Owner and Production Manager (November 2015 – October 2016)

*Miss Dee Organics, Gilroy, CA*

- California Certified Organic Farm
- Specializing in production of Seed Grade Garlic (11 specialty varieties).
- Decision making on soil amendments, pest control, cultivation, irrigation scheduling, etc.

Agronomic Intern (June 2015 - August 2015)

*Advisor – Michael Atkins (805-451-0404); Crop Production Services, Santa Maria, CA*

- Assist Michael Atkins in fertility, pest control, irrigation, etc. recommendations on various row and tree crops through Central Coast of California.
- Design, conduct, and analysis of research trials on various row and tree crops with the use of alternative products (fertilizers, organic amendments, pesticides) to grower's standard practices as well as use of technology for analytics such as weather stations, probes and meters, and leaf and soil analysis.

**Field Trial Experience**

Advisor – Michael Atkins

- Analysis of varied application rates of monopotassium phosphorous and dipotassium phosphorous in field strawberry (varieties: Aromas, Monterrey, Selva, Chandler) for increased yield and quality.
- Locate the optimal fungicide application rates in spinach in effort to meet export MRLs.
- Assess the effect of Mycorrhizal fungi inoculation at transplant on yield and quality of head lettuce.
- Assess the effect of Mycorrhizal fungi inoculation at transplant on yield and quality of peppers (Jalapeño, Bell, Habanero).

Advisor – Doug Barnes

- Assess the effect of a blend of seaweed extract, soil surfactant, and *Bacillus spp.* on yield and quality of Raspberry.

Advisor – Paul Maxwell

- Investigate organic fungicide use and optimization in garlic production for control of garlic rust (*Puccinia spp.*).

Advisor – Dr. Michael Kantar

- Phenotyping of barley for microbial GWAS study

## Conferences Attended

NAPB Annual Meeting (2021); Cornell University; Ithaca, New York; August 15-19, 2021

CAPCA Spring Conference (2018); Anaheim, CA; October 10-16, 2018

CAPCA/UCR Entomology Conference; Escondido, CA, September 12, 2018

Nursery Greenhouse Conference; Escondido, CA; June 6, 2018

Bio-Controls USA West 2018, 2018 Spring Meeting & International Symposium; Biological Products Industry Alliance (BPIA); Carlsbad, CA; March 7-9, 2018

California Citrus Mutual (CCM) Annual Meeting; Visalia, CA; November 16, 2017

CAPCA Spring Conference (2017); Reno, NV; October 15-17, 2017

California Citrus Mutual (CCM) Annual Meeting; Visalia, CA; November 17, 2016

## Oral and Poster Presentations

Seminar Presentation to the International Center for Tropical Agriculture (CIAT) – Alliance Biodiversity titled “Wild relatives of potato may bolster its adaptation to new niches under future climate scenarios”; June 7, 2022

Poster Presentation “Simulation and Evidence: Comparison of predicted and realized phenotypic gain during the domestication of *Stevia rebaudiana*” at 46<sup>th</sup> Annual Tester Symposium, UH Manoa School of Life Sciences, April 20-22, 2022 (**Best Graduate Poster Runner-Up**)

Presentation to the UH Manoa program Ho‘ākamai! Building Expertise In Fact Using Active Learning (BE-FACTUAL) about tropical plant breeding; June 2021

## Popular Press Articles

Fumia, N., Kantar, M., Radovich, T. (2022, October 19). Nathan Fumia is in The Science Zone on in Your Head with Professor Ted [Radio broadcast]. KTUH. <https://ktuh.org/podcasts>

Wight, A. J., Fumia, N., Kantar, M.B., Khoury, C. (2022). *Better Breeding Tools for Future-Proofing Potatoes*. Alliance Biodiversity-CIAT. <https://alliancebiodiversityciat.org/stories/future-proofing-potatoes>

## Languages

English – native fluency  
Spanish – conversational fluency

## Licenses

California Agricultural Pest Control Advisor (PCA-142119) License – California Department of Pesticide Regulation  
B-License and Member – United States Parachute Association (USPA)  
Level 2 Freediver (L1009418) – Freediving Instructors International (FII)  
Adult First Aid/CPR/AED (00F5G19) – American Red Cross

## Memberships

Member – California Association of Pest Control Advisors (CAPCA)  
Member – American Society of Horticultural Science (ASHS)  
Member – National Association of Plant Breeders (NAPB)

## Volunteering/Teaching/Panels

Panelist for “Press Exposure”; Communication in the Sciences (TPSS 654); Tropical Plant and Soil Sciences Department, UH Manoa; December 2, 2022

Panelist for “Taking the Comprehensive Exam”; Evoluncheon; Ecology, Evolution, and Conservation Biology; November 18, 2022

Mentor for Greenhouse Facilities Learning, Waipahu High School Internship Program; January to April 2022

Fall Break 2021 Presenter on Greenhouse Technologies; Seeds 4 Tomorrow, October 12, 2021

## Skills

Analytics: Leaf tissue sampling and analysis, soil sampling and analysis, water and fertigation analysis, fruit brix sampling and analysis, quantifying variety specific abiotic and biotic stress resistance, plant growth data collection and analysis, trait heritability index, environmental niche, regression analysis, phylogenetic inferences and comparative methods

Cultivation Methods: Agriculture (organic, synthetic, sustainable); Horticulture (organic/sustainable, synthetic hydroponics)

Instruments: Tensiometer, Electrical Conductivity Meter, pH Meter, Refractometer, Hydrometer, EnviroPro Soil Probe, High Pressure Liquid Chromatography (HPLC)

Software: R Statistical Software, Linux, MrBayes, BEAST2, GENEious Bioinformatics, Greenhouse Environmental Control Software (Link4 and Argus), Anderson Inline Fertigation, iUNU Luna Imaging

Integrated Pest Management Programs: Strawberry, Cane Berry (Raspberry and Blackberry), Lettuce, Leafy Greens, Brussels Sprouts, Artichoke, Broccoli, Cherry, Walnut, Pistachio, Citrus, Garlic, Sweet Corn, Peppers, Field Tomato, Lima Beans, Cannabis (Greenhouse and Field)