

Michael A. Hardigan
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Education and Research Experience

- 4/2017-** **Postdoctoral research associate**, Knapp Lab, Department of Plant Sciences, University of California - Davis
- 12/2016-3/2017** **Postdoctoral research associate**, Department of Plant Biology, Michigan State University, Buell Lab, East Lansing MI
- 1/2012-12/2016** **Ph.D. in Plant Breeding, Genetics, and Biotechnology**, Michigan State University, College of Agriculture and Natural Resources; GPA: 4.0

Dissertation Title: Genome biology of the tuber crop potato and its wild relatives, and the impacts of polyploidy on plant growth, development and genome structure.
Advisor: C. Robin Buell, Plant Biology Department

My graduate research involved the use of high-throughput sequence data and bioinformatics approaches to study genome structure and genetic diversity of the cultivated potato and its wild tuber-bearing relatives. This work includes a focus on identifying genes critical to potato domestication. I have examined structural variation in polyploid potato genomes to study the effects of asexual reproduction and polyploidy on plant genome structure, and their impact on plant vigor. My training as a Ph.D. student has placed an emphasis on programming and implementation of bioinformatics software for analysis of large data sets.

- 1/2012-12/2016** **Graduate Research Assistant**, *Michigan State University, Plant Breeding, Genetics, Biotechnology Graduate (PBGB) Program, Buell Laboratory*
- 2007-2011** **B.S. in Horticulture**, Michigan State University; Specialization: Breeding & Genetics; Graduate with High Honors; GPA: 3.9675

Undergraduate Research Experience

- 2011** *Undergraduate Research Assistant, Michigan State University, Crops & Soil Science Department*
- Laboratory assistant to Dr. Mitch McGrath, sugar beet breeder and geneticist
 - Analysis of genetic markers in sugar-beet mapping populations, quantitative analysis of gene expression
- 2010** *Undergraduate Research Assistant, Michigan State University, Horticulture Department*
- Research assistant to Dr. Amy Iezzoni, cherry breeder, and Dr. Janet Lewis, wheat breeder
 - Cherry breeding and genetics, wheat breeding and genetics
- 2009** *Undergraduate Research Assistant, Michigan State University, Horticulture Department*
- Research assistant to Dr. Eric Hanson, berry crop research lab

- Studied production/market quality of newly release varieties of blueberries, blackberries, raspberries, and small fruits
- Analysis of soil chemistry and fertility

2008 *Undergraduate Research Assistant, Michigan State University, Crop & Soil Science Department*

- Full-time research assistant to Dr. Christie Sprague
- Environmental studies on weed germination/management in field crop setting

Skillset

- Handling/QC of high-throughput sequence data (WGS, RNA-seq, ChIP-seq)
- Programming in UNIX, Perl, R, with focus on custom scripting and data analysis
- Familiarity with a broad range of existing bioinformatics and genomics software tools
- Running and managing jobs on a server or computing cluster
- Genome-wide analysis of variation including SNPs, indels, large copy number variants (CNV) and presence/absence variants (PAV)
- Population/comparative genomics analysis, identifying loci under selection using a combination high throughput data analysis and various population metrics
- Phylogenetic analysis, tree building
- Quantitative genetics; QTL mapping, genome wide association studies (GWAS), and genomic prediction for various plant traits
- Plant propagation, growth, maintenance, and pest management
- Basic wet lab skills including DNA/RNA extraction, PCR, electrophoresis
- Tissue culture
- Horticulture experience; propagation and management of plants in controlled, greenhouse and cultivated field settings

Publications

Hardigan, M.A., Newton, L., Crisovan, E., Wiegert-Rininger, K., Wood, J., Laimbeer, P.E., Veilleux, R., Douches, D.S., Farre, E.M. & Buell, C.R. (2016) Genome diversity of tuber bearing *Solanum* uncovers complex evolutionary history and targets of domestication in the cultivated potato. *PNAS* (**under review**).

Laimbeer, P.E., Holt, S.H., Makris, M., **Hardigan, M.A.**, Buell, C.R. & Veilleux, R.E. (2017). Protoplast isolation prior to flow cytometry reveals clear patterns of endoreduplication in potato tubers, related species, and some starchy root crops. *Plant Methods* 13(1): 27.

Zhao, D., Hamilton, J.P., **Hardigan, M.A.**, Yin, D., He, T., Vaillancourt, B., Reynoso, M., Pauluzzi, G.D., Funkhouser, S., Cui, Y., Bailey-Serres, J., Jiang, J., Buell, C.R., & Jiang, N. (2016). Analysis of ribosome-associated mRNAs in rice reveals the importance of transcript size and GC content in translation. *G3: Genes / Genomes / Genetics*: doi:10.1534/g3.116.036020.

Peterson, B.A., Holt, S.H., Laimbeer, P.E., Doullis A.G., Coombs, J., Douches, D.S., **Hardigan, M.A.**, Buell, C.R. & Veilleux, R.E. (2016) Self-fertility in a cultivated diploid potato population examined with the Infinium 8303 potato single-nucleotide polymorphism array. *The Plant Genome* 9: doi:10.3835/plantgenome2016.01.0003.

Hardigan, M.A., Crisovan, E., Hamilton, J.P., Kim, J., Laimbeer, P., Manrique-Carpintero, N.C., Newton, L., Pham, G., Vaillancourt, B., Yang, X., Zeng, Z., Douches, D.S., Jiang, J., Veilleux, R., Buell, C.R. (2016). Genome reduction reveals a large dispensable genome and adaptive role for copy number variation in asexually propagated *Solanum tuberosum*. *Plant Cell*, 28: 388-405.

Hardigan, M.A., Bamberg, J., Buell, C.R., & Douches, D.S. (2014). Taxonomy and Genetic Differentiation among Wild and Cultivated Germplasm of *Solanum* sect. *Petota*. *The Plant Genome* 8: doi:10.3835/plantgenome2014.06.0025.

Douches, D., Hirsch, C.N., Manrique-Carpintero, N.C., Massa, A.N., Coombs, J., **Hardigan, M.**, Bisognin, D., De Jong, W., & Buell, C.R. (2014). The Contribution of the Solanaceae Coordinated Agricultural Project to Potato Breeding. *Potato Research*, 57(3-4): 215-224.

Presentations

Michael Hardigan, Linsey Newton, Emily Crisovan, Krystle Wiegert-Rininger, Joshua Wood, Parker Laimbeer, Richard Veilleux, David Douches, Eva Farre, C. Robin Buell. Genome Diversity of Tuber Bearing *Solanum* Species Uncovers Targets of Selection During Potato Domestication. NCCC215: Potato Breeding and Genetics Technical Committee, Chicago, IL, December 2016.

Michael Hardigan, Emily Crisovan, John Hamilton, Jeongwoon Kim, Parker Laimbeer, Norma Manrique-Carpintero, Linsey Newton, Gina Pham, Brieanne Vaillancourt, Xixian Zeng, David Douches, Jiming Jiang, Richard Veilleux, C. Robin Buell. Copy Number Variation is a Major Contributor to Genome Diversity in Asexually Propagated Diploid Potato. 12th Solanaceae Conference, Bordeaux, France, October 2015.

C. Robin Buell, **Michael Hardigan**, John Bamberg and David Douches. Loci Involved in Domestication and Improvement of Cultivated Potato As Revealed through Genotyping of Two Diversity Panels. Plant and Animal Genome Meeting XXIII, San Diego, CA, January 2015.

C. Robin Buell, Norma Manrique-Carpintero, Joe Coombs, Emily Crisovan, Yuehua Cui, David Douches, John Hamiton, **Michael Hardigan**, Cory Hirsch, Jiming Jiang, Parker Laimbeer, Xu Liu, Rachael Naegle, Kendall Upham, Brieanne Vaillancourt, Richard Veilleux, Honglang Wang, Susan Wiegus, Yufeng Wu, Zixian Zeng. Unraveling the Heterozygosity, Allelic Composition, and Copy Number Variation of Potato. Plant and Animal Genome Meeting XXII, San Diego, CA, January 2014.

Journals Reviewed

BioScience - 2016

Activities and Awards

- Education and Outreach, sat on graduate student advisor panel providing guidance to undergraduate students in the Plant Genomics @ MSU REU Program seeking future graduate positions (Summer 2016)
- Education and Outreach, classification activities, medicinal and industrial applications of mint family plant species with local elementary school students (2016)

- Education and Outreach, biotechnology applications and lab techniques with Future Farmers of American (FFA) high school students (2015, 2016)
- Recipient, MSU-Plant Science Excellence Fellowship Awards of Excellence fellowship (Summer 2015)
- Recipient, Michigan State University Plant Science Excellence Fellowship (2014)
- Recipient, The Elmer C. Rossman Endowed Graduate Student Support Award (2014)
- Recipient, The Norman R. and Jessie A. Thompson Endowment in Crop and Soil Sciences (2014)
- Recipient, National Potato Council Academic Scholarship (2012)
- Recipient, Michigan State Horticultural Society scholarship (2011)
- Recipient, American Society for Horticultural Science's Collegiate Scholars Award (2009-2011)
- Dean's List, Fall and Spring semesters (2007-2011)
- Former member Michigan State University's Horticulture Club (2007-2012)