Richard Tegtmeier

Plant Breeding and Genetics | School of Integrative Plant Sciences | Cornell University

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Education

Ph.D. Cornell University, Plant Breeding and Genetics (GPA: 3.70) 2019-*Present*
Minors: Plant Pathology, Genomics | *Grad. March 2025*

B.S. Salve Regina University, Biology (GPA: 3.63) 2015-2019
Minor: Music Performance

Research Experience

Graduate Research Fellow 2019-*Present*
Cornell University, Plant Breeding and Genetics
(Advisor: Dr. Awais Khan)

- Conducting research to integrate genomics and transcriptomics to identify novel QTL associated with fire blight (*Erwinia amylovora*) resistance from the primary progenitor species of domesticated apples
- Identified a novel moderate effect fire blight resistance QTL and developed diagnostic markers
- Fine mapping the novel fire blight resistance QTL and performing candidate gene selection
- Developed an image-analysis based leaf disc assay for rapid screening of fire blight resistance in apple and applicable to other relevant perennial tree crops
- Collaborated with international teams on three comprehensive review papers (one first-author)
- Mentored 3 undergraduate students with one mentee continuing to a PhD in plant breeding and genetics at Cornell

REU Summer Research Scholar *Sum. 2018*
Cornell AgriTech, Plant Pathology and Plant-Microbe Biology
(Advisor: Dr. Awais Khan)

- Performed GWAS on a diverse panel of apple accessions to identify novel fire blight resistance alleles
- Performed DNA extraction and PCR contributing to the multi-state RosBREED apple improvement initiative to support genotyping efforts

Undergraduate Researcher 2018-2019
Salve Regina University, Department of Biology
(Advisor: Dr. Steven Symington)

- Performed CRISPR/Cas9 mediated knockouts of the nicotinic acetylcholine receptors responsible for calcium regulation in a HEPG2 liver cell line
- Generated teaching materials for undergraduate students to understand CRISPR technology

Agricultural Experience

Student Lab Manager 2016-2019

Salve Regina University Hydroponics Lab, Newport RI

- Managed student research projects, hydroponic water chemistry, tours, and outreach initiatives
- Designed and tested experimental hydroponic systems and light-nutrient regiments for improved organic crop production indoors (basil, tomatoes, leafy greens)

Hydroponic Greenhouse Manager *Sum. 2017*

Fable: From Farm to Table, Ossining, NY

- Managed a commercial organic greenhouse with vertical hydroponic NFT systems and conducted cost analyses of inputs and outputs to maximize profit

Aquaponic Greenhouse Assistant *Sum. 2016*

Cabbage Hill Farm, Mt Kisco, NY

- Assisted in water chemistry maintenance, growth optimization, and harvest of diverse varieties of edible crop and fish species in a commercial organic greenhouse

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Publications

Research Articles

Tegtmeier, R., Hickok, D., Robbins K., Khan, A. (2024). An image-analysis based leaf disc assay for the rapid evaluation of genetic resistance to fire blight in apples. *European Journal of Plant Pathology* 168, 249–259. https://doi.org/10.1007/s10658-023-02750-8

Tegtmeier, R., Cobb-Smith, D., Zhong, G-Y., Khan, A. (2023) Identification and marker development of a moderate-effect fire blight resistance QTL in *M. sieversii*, the primary progenitor of domesticated apples. *Tree Genetics & Genomes* 19, 50. https://doi.org/10.1007/s11295-023-01626-6

Tegtmeier, R., Pompili, V., Singh, J., Micheletti, D., Silva, K. J. P., Malnoy, M., Khan, A. (2020) Candidate gene mapping identifies genomic variations in the fire blight susceptibility genes *HIPM* and *DIPM* across the *Malus* germplasm. *Scientific Reports*, Rep 10, 16317. https://doi.org/10.1038/s41598-020-73284-w

Review Articles

Sabety, J., Svara, A., **Tegtmeier, R.**, Feulner, H., Cho, P., Sakina, A., Hickok, D., Khan, A. (2024) Unlocking diversity from wild relatives of perennial fruit crops in the pan-genomics era, Opinion in Plant Biology. Current Opinion in Plant Biology, https://doi.org/10.1016/j.pbi.2024.102652

Tegtmeier, R., Švara, A., Gritsenko, D., Khan, A. (2024). *Malus sieversii*: a historical, genetic, and conservational perspective of the primary progenitor species of domesticated apples, *Horticulture Research*; https://doi.org/10.1093/hr/uhae244

Li, J., Zhang, M., Li, X., Khan, A., Kumar, S., Allan, A. C., Lin-Wang, K., Espley, R. V., Wang, C., Wang, R., Xue, C., Yao, G., Qin, M., Sun, M., **Tegtmeier, R.**, Liu, H., Wei, W., Ming, M., Zhang, S., Zhao, K., Song, B., Ni, J., An, J., Korban, S. S., Wu, J. (2022). Pear genetics:

Recent advances, new prospects, and a roadmap for the future. *Horticulture Research*, Volume. 9. https://doi.org/10.1093/hr/uhab040

Extension Articles

Feulner, H., **Tegtmeier, R.**, Khan, A., van Zoeren, J. (2024). Genome-wide association mapping: What is it and why is it important for the development of fruit cultivars? *Cornell Cooperative Extension Fruit Notes*, 24(5). https://rvpadmin.cce.cornell.edu/pdf/lof_newsletter/pdf326_pdf.pdf

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Presentations

Tegtmeier, R., Khan, M.A., (2024). Fine mapping the moderate-effect fire blight resistance QTL from the primary progenitor of domesticated apples, *Malus sieversii*, NAPB 2024 Annual Meeting, [Poster]

Tegtmeier, R., Khan, M.A., (2024). Fine mapping the moderate-effect fire blight resistance QTL from the primary progenitor of domesticated apples, *Malus sieversii*, SAGES Research Symposium, [Oral]

Tegtmeier, R., Cobb-Smith D., Zhong G., Khan, M.A., (2023). Identification and development of markers for a moderate-effect fire blight resistance QTL in *M. sieversii*, the primary progenitor of domesticated apples, NAPB 2023 Annual Meeting, [Poster]

Tegtmeier, R., Villwock, S., Kunze, K., Lukach, M., (2023). Everything home gardeners want to ask about plant breeding, Cornell Cooperative Extension Master Gardeners Program, Online [Oral]

Tegtmeier, R., Khan, M.A., (2022). Mapping novel QTL for fire blight resistance in the primary progenitor species of domesticated apples (*M. domestica*), 3rd International Symposium on Fire Blight of Rosaceous Plants, Dresden, Germany [Oral]

Tegtmeier, R., Pompili V., Singh J., Micheletti D., Silva K.J.P, Malnoy M., Khan, M.A., (2022). Utilizing susceptibility and resistance genes to develop fire blight resistant apples via breeding and genome-editing", 2022 Cornell NYS Tree Fruit Conference, Online [Oral], https://www.youtube.com/watch?v=M6qzCJ4uk9E

Tegtmeier, R., Pompili V., Singh J., Micheletti D., Silva K.J.P, Malnoy M., Khan, M.A., (2021). Genetics and Genome Editing of Fire Blight Susceptibility Genes as a Robust Strategy to Develop Improved Apple Cultivars, NAPB 2021 Annual Meeting, Online [Poster]

Tegtmeier, R., Pompili V., Singh J., Micheletti D., Silva K.J.P, Malnoy M., Khan, M.A., (2020). Genomic Variation in the Genes Responsible for Fire Blight Susceptibility in Apples", Cornell Agriculture, Food & Environmental Systems In-Service Survey, Online [Oral]

Tegtmeier, R., Singh J., Silva K.J.P., Khan, M.A., (2020). Identification of Fire Blight Resistant Malus Germplasm for Apple Breeding and Genetics Research", NAPB 2020 Annual Meeting, Online [Poster]

Tegtmeier, R., Singh J., Silva K.J.P., Khan, M.A., (2020). Identification of Fire Blight Resistant Malus Germplasm for Apple Breeding and Genetics Research", 7th International Horticulture Research Conference, Online [Poster]

Tegtmeier, R., Singh J., Fabrizio J., Desnoues E.,Silva K.J.P., Busch W.,Khan, M.A., (2019). Rootstock Genotypes Influence Response to Fire Blight in Grafted Apple Scion Cultivars, 2nd International Symposium on Fire Blight of Rosaceous Plants, Traverse City, MI [Oral]

Tegtmeier, R., Singh J., Silva K.J.P., Khan, M.A., (2018). Exploring Global Apple Diversity to Mine for Fire Blight Resistance Alleles, Summer Scholars Symposium, Cornell AgriTech, Geneva, NY [Poster]

Reviewer Experience (2019-*Present*)

1) The American Phytopathological Society - Phytopathology, **2)** BMC Plant Biology **3)** The American Phytopathological Society - Plant Disease **4)** Cornell Schmittau-Novak Collaborative Grant Funding **5)** Nature- Horticulture Research, **6)** Springer-Tropical Plant Biology, **7)** Agronomy Journal

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Teaching and Mentoring

Designed and led a 5-part R workshop for Cornell AgriTech Summer Scholars 2023, 2024

Teaching Assistantship, PLBR 2250, Plant Genetics, Cornell University 2022

Project Mentor for 3 Cornell Summer Scholar Undergraduate Researchers 2019-2022

- *My 2022 Summer Scholar mentee has started a PhD in the Cornell Plant Breeding and Genetics section in Lance Cadle-Davidson's lab*

Grants and Scholarships

National Association of Plant Breeders - Borlaug Scholar Award 2024

Apple R&D Program Grant Funding ($50,000 awarded/year; 4 years) 2020-2024

Cornell Plant Breeding and Genetics - Murphy Munger Award ($500 awarded) 2023

"Outstanding performance in the areas of scientific achievement, contributions to teaching or departmental activities, service to the community or profession…"

USDA NIFA Predoctoral Fellowship ($120,000 awarded; 2 years funding) 2023

Project Title: "Mapping the genetic basis of fire blight resistance in Malus sieversii, the primary progenitor species of apples"

NAPB Poster Competition Winner (2nd of 50 PhD students, $250 awarded) 2021

Cornell Schmittau-Novak Collaborative Grant Funding ($10,000 awarded) 2020

Science Research Award, Salve Regina University Department of Biology 2019

Graduating with Honors, Cum Laude, Salve Regina University 2019

"Who's Who" Leadership Award, Salve Regina University 2018

Professional Activities

Member of the Cornell Plant Pathology faculty search committee 2023-2024
- *Moonshot initiative: Revolutionizing Controlled Environment Agriculture*

Synapsis, Co-President (Cornell Plant Breeding Graduate Student Organization) 2021-2022
- *Led initiative to have faculty provide need-based relocation funding to incoming graduate students to reduce inequities related to travel costs*

SAGES, Symposium Co-Chair (Cornell AgriTech Graduate Student Organization) 2021-2023

Synapsis & SAGES, Graduate and Professional Studies Assembly Representative 2020-2021

Member of the National Association of Plant Breeders (NAPB) 2019-2024

Synapsis, Chair of Seed Sales Fundraiser 2019-2021

Synapsis, Graduate Student Symposium Organizer 2019

Extension Experience

Led seminar to 70 Cornell Master Gardeners on plant breeding concepts in gardening 2023
- *Topics ranged from basic terminology (i.e. hybrid, open pollinated) to complex issues of genetically engineered crops in the food system*

Led an apple breeding/pollination workshop for plant breeding graduate students 2022

Assisted in a workshop on *Malus* genetic diversity and disease identification 2021

Extension Assistantship: Improvement of the Apple Disease Info Database 2020
https://blogs.cornell.edu/applevarietydatabase/

Assisted in leading an apple grower workshop in disease management utilizing UAV mounted multispectral sensors 2019

Relevant Skills

Programming - R | Python | Bash/Shell scripting | Git | Conda | Reproducible analysis

Bioinformatics - Genome assembly | QC | Variant calling |Gene annotation | Visualization

Genetic Mapping - Linkage map construction | Linkage mapping | GWAS

Molecular Biology - Marker design and genotyping (SSR, KASP) | CRISPR/Cas9 gRNA design

Phenomics - ImageJ (Fiji) | ImageJ Macro Language | PlantCV | OpenCV | Hyperspectral

Drone Imaging - Data acquisition and processing | Object segmentation | Feature extraction

Plant Pathology - Bacterial inoculations | Inoculation assay design (leaf disc assay)

Relevant Coursework

Multi-Omic Integration for AI Genomic Prediction Breeding - University of Florida

BTRY 6830 Quantitative Genomics & Genetics - Cornell University

BTRY 6010-20 Statistical Methods I & II - Cornell University

PLBRG 4030 Genetic Improvement of Crop Plants - Cornell University

PLPPM 5010 Biology and Management of Plant Diseases - Cornell University

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Professional References

Dr. Awais Khan

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Relationship: PhD committee member

Dr. Lance Cadle-Davidson

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Phone: (315) 787-2442
Relationship: Mentoring scientist