

Robert Z. Shrote

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Education

- Ph.D. Michigan State University August 2019 – Present
Program: Plant Breeding, Genetics, and Biotechnology
Principal Investigator: Dr. Addie Thompson
Ph.D. Committee Members:
Dr. Wolfgang Banzhaf
Dr. Gustavo de los Campos
Dr. Francisco Gomez
Dr. Eric Olson
Cumulative GPA: 4.0/4.0
- B.S. Purdue University May 2019
Major: Plant Genetics, Breeding, and Biotechnology
Minors: Statistics, Biochemistry
Cumulative GPA: 4.0/4.0

Research Experience

Graduate Researcher, Department of Plant, Soil, and Microbial Sciences, Michigan State University August 2019 – Present

Studying genomic selection and genomic mating optimization strategies for single and multiple objectives. Developing novel genomic selection and mating criteria for breeding population improvement. Developing a breeding simulation and optimization software package in Python. Assessing algorithmic strategies for optimizing single- and multi-objective genomic selection and mating objective functions. Algorithmic strategies include genetic algorithms and hill-climbing algorithms.

Assisted in leading pollination crews to perform 3:2 crosses, 1:1 crosses, and self-pollinations in corn. Worked with a team to perform hand-planting of corn nursery materials. Coordinated with a team to rate Tar Spot disease severity in corn trials. Coordinated with a team to collect flowering, plant height, leaf number, and biomass data in both corn and sorghum. Assisted in hand shelling and packaging of corn seed.

Undergraduate Researcher, Department of Agronomy, Purdue University April 2017 – May 2019

Studied in a wheat and small grains lab underneath Dr. Mohsen Mohammadi. Studied the function of Arabidopsis homologs to three candidate wheat genes, identified through GWAS and transcriptomics. Candidate genes were associated with yield, drought tolerance, and early root development. Utilized biotechnology to create overexpression lines for each gene in *Arabidopsis thaliana*. Utilized CRISPR/Cas9 to create *A. thaliana* mutants for one gene of interest. Utilized Wheat Ensembl BLAST to locate genes associated with molecular markers of interest. Compared wheat gene sequences against non-wheat gene sequences using NCBI BLAST to infer identity and function. Studied genotyping-by-sequencing and genome wide association methods. Utilized BWA, TASSEL 5, and GAPIT to identify quantitative trait loci for kernel weight and size in a sample wheat dataset. Briefly studied RNA-sequencing methods to study differences in wheat transcriptomes. Was exposed to various other Unix based bioinformatic tools including: BEDTools,

BEDOPS, Bowtie2, BLAT, FastQC, HISAT2, HMMer, HTSeq, InterPro, MEME Suite, Picard, and SAMtools. Assisted in wheat data collection and harvest during the 2018 season.

Plant Breeding Intern, AgReliant Genetics, LLC, Lebanon, IN

May 2017 – August 2017

Coordinated with a team to perform mechanized and non-mechanized planting of corn trials. Recorded corn trial stand counts for selection, replanting, and modeling purposes. Worked with a team to inoculate corn plants with pathogens causing Northern Corn Leaf Blight, Anthracnose Stalk Rot, Goss's Wilt, and Grey Leaf Spot. Led detasseling teams to detassel isolation and induction isolation fields. Led a pollination crew that performed 3:1 crosses, 1:1 crosses, and self-pollinations. Induced brittle snap in developing corn for screening and predictive purposes. Made selections on hybrids designated for use in doubled haploid production.

Pollinator, AgReliant Genetics, LLC, Lebanon, IN

July 2016 – August 2016

Coordinated with a team to perform corn pollinations and crosses including 3:1 crosses, reciprocal crosses, self-pollinations, and induction pollinations. Inoculated inbred lines with pathogens to test for disease resistance. Sampled corn plant tissues for genomic analysis. Observed a corn breeder make double haploid selections and learned about selection criteria.

Publications

Morris, D., **Shrote, R.**, Tan, R., Newton, L., Goodwin, R., Bunting, E., Lipka, A., Olsen, P., and Thompson, A. (2021). Modeling canopy architecture traits using UAS-acquired LiDAR features in diverse maize varieties. *Earth and Space Science Open Archive*.
<https://doi.org/10.1002/essoar.10508340.1>

Bryson, A. E., Wilson Brown, M., Mullins, J., Dong, W., Bahmani, K., Bornowski, N., Chiu, C., Engelgau, P., Gettings, B., Gomezcano, F., Gregory, L. M., Haber, A. C., Hoh, D., Jennings, E. E., Ji, Z., Kaur, P., Kenchanmane Raju, S. K., Long, Y., Lotreck, S. G., Mathieu, D. T., Ranaweera, T., Ritter, E. J., Sadohara, R., **Shrote, R. Z.**, Smith, K. E., Teresi, S. J., Venegas, J., Wang, H., Wilson, M. L., Tarrant, A. R., Frank, M. H., Migicovsky, Z., Kumar, J., VanBuren, R., Londo, J. P., and Chitwood, D. H. (2020). Composite modeling of leaf shape along shoots discriminates *Vitis* species better than individual leaves. *Applications in Plant Sciences*, 8(12), e11404.
<https://doi.org/10.1002/aps3.11404>

Research Presentations

Shrote, R. and Thompson, A. (2021). Improving genomic selection through the addition of a competing diversity objective. 63rd Annual Maize Genetics Meeting. Mar 12. Online.

Shrote, R. and Thompson, A. (2021). Improving genomic selection through the addition of a competing diversity objective. Corn Breeding Meeting Conference. Feb 18. Online.

Shrote, R. and Thompson, A. (2020). Integer/categorical particle swarm optimization improves the performance of optimal population value selection. 62nd Annual Maize Genetics Meeting. June 25. Online.

Shrote, R. and Thompson, A. (2019). Integer/categorical particle swarm optimization improves the performance of optimal population value selection. MSU Corteva-PBGB-NRT IMPACTS Symposium. December 13. East Lansing, MI, USA.

Shrote, R., Zhou, X., and Mohammadi, M. (2019). The *SLOW GROWTH4* Locus Encodes a Pentatricopeptide Repeat Protein Required for Plant Development in *Arabidopsis thaliana*. Purdue Undergraduate Research Conference. April 9, West Lafayette, IN, USA.

Shrote, R., Zhou, X., and Mohammadi, M. (2018). Functional genomics of three wheat candidate genes, identified through GWAS and transcriptomics, in *Arabidopsis thaliana* (poster presentation). Purdue College of Agriculture Graduate Student Welcoming and Networking Event. September 7, West Lafayette, IN, USA.

Shrote, R., Zhou, X., and Mohammadi, M. (2018). Functional genomics of three wheat candidate genes, identified through GWAS and transcriptomics, in *Arabidopsis thaliana* (poster presentation). Corteva Agrosience. July 26, Indianapolis, IN, USA.

Shrote, R., Zhou, X., and Mohammadi, M. (2018). Functional analysis of a little protein by gene overexpression and CRISPR/Cas9-mediated gene knockout (poster presentation). Purdue Plant Science Social. April 5, West Lafayette, IN, USA.

Honors and Awards

National Science Foundation Research Traineeship IMPACTS Fellowship	August 2020
MSU Plant Science Fellowship	August 2019
Alpha Lambda Delta Honors Fraternity	March 2016
Eagle Scout with Palms	December 2012

Professional Memberships

National Association of Plant Breeders

Computer Programming Skills

Bash & Shell Script
C Programming Language
C++ Programming Language
Java Programming Language
Python Programming Language
R Programming Language
SAS

Computer Skills

BEDTools
Linux Operating System
Microsoft Office Suite
NCBI BLAST
TASSEL 5 GBS Pipeline