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Plant Genetics & Crop Breeding
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Education

Doctor of Philosophy

Quantitative Genetics & Breeding, Plant Sciences, North Dakota State University, Fargo 2014. GPA 3.9/4.0

Dissertation: Usefulness of Expired Proprietary (ex-PVP) Maize (*Zea mays* L.) Germplasm for U.S. Northern Breeding Programs

Master of Science

Genetics and Plant Breeding, Bangladesh Agricultural University (BAU), Mymensingh, 2005. GPA 3.9/4.0

Thesis: Genetic Analysis of Yield and Yield Contributing Characters in Spring Wheat (*Triticum aestivum* L.) under two Sowing Dates

Bachelor of Science

General Agriculture, Bangladesh Agricultural University (BAU), Mymensingh, 2003. First Class Honors.

Significant Honors and Awards

- Glenn Smith Memorial Scholarship – NDSU, 2013 & 2010.
- Charles and Linda Moses Presidential Graduate Fellowship – NDSU, 2012.
- Third prize at the 28th Plant Sciences Graduate Student Symposium – University of Manitoba, Winnipeg, Canada, 2012.
- Eric Matthew Miller Memorial Scholarship – NDSU, 2011.
- Best speaker and Champion, Intramural Debate Competition, BAU, 2003.
- Best speaker on 'Arsenic Pollution in Bangladesh,' BAU, 2001.

Academic Appointments

2025 - Current	Assistant Professor, Department of Plant and Environmental Sciences, NMSU
2014 - 2018	Associate Professor, Department of Genetics and Plant Breeding, BAU
2009- 2014	Graduate Research Assistant, Corn Breeding and Quantitative Genetics, Dept. of Plant Sciences, NDSU Teaching Assistant, Quantitative Genetics, Spring 2010.
2007- 2009	Assistant Professor, Department of Genetics and Plant Breeding, BAU.

2005- 2007

Lecturer, Department of Genetics and
Plant Breeding, BAU.

Research Appointments

Assistant Professor (Mar 2025 – Current)

New Mexico State University, Plant and Environmental Science

Projects: Enhancing Alfalfa and Forage Crops

Improving water use efficiency, salinity tolerance, and resistance to diseases and pests in alfalfa and other forage crops, while maintaining yield and forage quality. Key initiatives include:

- **Recurrent Selection and Classical Breeding:** Utilizing traditional breeding methods to recombine and improve plant traits
- **High-Throughput Phenotyping:** Employing UAVs and satellites to capture plant phenotypes efficiently.
- **Genetic Dissection, Trait Association, and Pangenome Studies:** Navigating comparative genomic studies, identifying associated markers for desirable traits, developing, and utilizing markers for marker-assisted breeding
- **Genomic and Phenomic Selection:** Integrating genomic data with phenomics and weather data to predict and improve selection.
- **Expression Profiling and Gene Editing:** Exploring gene expression patterns and employing CRISPR to edit the genome for desired traits.
- **Big Data, Machine Learning, and AI:** Leveraging big data and artificial intelligence to study genotype-by-environment (GxE) interactions and to develop predictive tools

Postdoctoral Fellow (June 2022 – Feb 2025)

Kansas State University, Agronomy

Project: DropXL Sorghum: A trait technology package for developing water optimized sorghum using drone imagery

- Discovered limited transpiration genotypes to maximize yield under drought conditions
- Executed trial of 340 NAM population on **1,040 plots** at four locations
- Phenotyped with **UAV** using RGB, multispectral and thermal sensors to identify and predict limited transpiration

Project: Ideotype Breeding: Harness high-throughput UAS imagery to sorghum yield

- Developing Computer Vision (**CV**) and Deep Learning (**DL**) models, specifically **YOLO**, **Faster R-CNN** to detect panicles, count grains, and predict yield

Postdoctoral Fellow (June 2020 – June 2022)

North Dakota State University, Plant Sciences

Project: Optimizing *Aphanomyces* root rot disease rating in pea using high-throughput phenotyping

- Designed and coordinated high-throughput phenotyping (HTP) research for disease rating of *Aphanomyces* root rot (ARR) in **dry pea**
- Analyzed visual and HTP-disease indices on 300 advanced **dry pea** lines derived from 1,820 plots (12,740 microplots) using mixed model in R
- Called 28,832 SNP markers on 300 NDSU advanced **dry pea** lines
- Conducted univariate and multivariate genomic selections, and genome-wide association mapping

Project: Harnessing genetic diversity in the USDA pea germplasm collection

- Designed and implemented genomic selection to tap genetic diversity within 482 USDA pea germplasm accessions; genotyped with 30,600 SNP markers
- Applied machine learning and statistical genomic prediction approaches in R and the Linux platform
- Identified valuable germplasm accessions

Project: Contributed pulse breeding core programs

- Planned and executed crosses in the field and greenhouse, MAGIC population development for pea
- Contributed to preliminary and advanced yield trials, and analyzed data leading to advanced material selection

Research Scholar (Feb 2018-May 2020)

Kansas State University, Plant Pathology

Project: Genome-wide Association Studies of CIMMYT wheat lines from South Asia

- Analyzed multi-location UAV- derived and yield-related wheat traits on 1,700 breeding lines from 2016 to 2018 cropping seasons; genotyped with 19,217 markers to discover climate resilient genes
- Conducted GWAS to map marker-trait associations (MTA) for yield and associated traits
- Executed using R, Python, and in supercomputing platforms

Project: Genomic prediction for yield and end-use quality of KSU wheat lines

- Applied univariate, multivariate genomic selection models to 462 advanced wheat lines genotyped with 30 K SNPs
- Discovered that multivariate predictive ability outperformed univariate models by two folds (151 to 168%)

Associate Professor (May 2014 -Feb 2018)

Bangladesh Agricultural University, Genetics and Plant Breeding

Responsibilities: Research, offered courses, mentor students

- Led **corn, wheat**, breeding programs, collaborated **soybean** breeding program, developed lines and hybrids
- Planned, developed, and taught courses on Quantitative Genetics, Plant Breeding, Experimental Design, and Statistical Analyses in R and SAS
- Mentored younger colleagues in courses, supervised research, and advised 15 graduate students' theses

Graduate Research Assistant (Aug 2009 – May 2014)

North Dakota State University, Plant Sciences

Project: Exploring expired proprietary corn germplasm

- Designed and implemented research to assess yield potential for early corn inbred lines and hybrids for North Dakota and adjacent regions
- Analyzed data from 4 locations across 2 years (5,408 field plots) to investigate the usefulness of corn materials using a mixed linear model
- Identified valuable corn inbred lines, e.g., LH54, ND2005, ND2006, and T5 were identified for grain protein content while NK807, NK779, PHK05, PHT77, ND291, ND2002, and T7 for starch content and hybrids
- Determined important heterotic groups and patterns in early ex-PVP corn germplasm pools

Projects: Contributed to the corn breeding program

- Engaged in germplasm adaptation, population improvement, inbred parent development, and hybrid production
- Planned summer and winter nurseries, conducted and managed state-wide multi-location field trials
- Traveled extensively within and across the state to collect data from preliminary and advanced yield trials
- Routinely analyzed preliminary and advanced yield trial data and recommended the best entries to advance or release
- Contributed to population development including EarlyGEM and QPMaize

Research Accomplishments

Funded Research Projects:

AI-Driven Predictive Breeding of Alfalfa to Enhance Drought Resilience, Yield, and Forage Quality for Sustainable Feed System in New Mexico. Center of Excellence in Sustainable Food and Agricultural Systems, NMSU. \$25,000 (2026-2027).

Facilitate Understanding, Promoting Ethical, and Efficient Application of AI Through a Course "AI Fundamentals for Predictive Analysis in Agriculture", NMSU AI Educational & Teaching Grants NMSU Institute for Applied Practice in AI and Machine Learning, \$25,000 (2025-2026).

Water-use efficient sorghum development for Kansas through high-throughput molecular marker discovery and deployment, Kansas Water Institute, U.S. Geological Survey, \$50,000 (2024-2026). (Co-PI).

Revealing combining abilities of wheat (*T. aestivum* L.) cultivars for days to heading, yield, and other agronomic traits, Bangladesh Agricultural University Research System, 150,000 (BDT) (2015-2016).

Genetic dissection of maize (*Zea mays* L.) inbreds for yield, early maturity and other agronomic traits for developing need-based cultivars, Ministry of Agriculture, Government of Bangladesh, 200,000 (BDT) (2014-2015).

Peer-Reviewed Publications:

1. **Bari, M.A.A.**, Bakshi, A., Choton, J.C., Pramanik, S., Witt, T.D., Caragea, D., Bean, S., Jagadish, K., Felderhoff, T. 2026. Deep learning for sorghum yield forecasting using uncrewed aerial systems and lab-derived imagery. *Plant Phenomics*. doi.org/10.1016/j.plaphe.2025.100133.
2. **Bari, M.A.A.**, Fonseka, D., Stenger, J., Zitnick-Anderson, K., Atanda, S. A., Worral, H., Piche, L., Kim, J., Morales, M., Johnson, J., Saldares, R. A., Flores, P., Pasche, J., Bandillo, N. 2023. A greenhouse-based high-throughput phenotyping platform for identification and genetic dissection of resistance to *Aphanomyces* root rot in field pea. *The Plant Phenome Journal*. doi.org/10.1002/ppj2.20063.
3. Mahmud, M.J., Sifat, H.S., Hossain, M. A., and **Bari, M.A.A.** 2023. Combining abilities of spring wheat (*Triticum aestivum* L.) for grain yield and related traits. *Fun Plant Breeding Journal*. <http://dx.doi.org/10.35418/2526-4117/v5a6>.
4. Atanda, S.A., Steffes, J., Lan, Y., **Bari, M.A.A.**, Kim, J., Morales M., Johnson, J., Saldares, R. A., Worral, H., Piche, L., Ross, A., Grusak, M., Coyne, C. J., McGee, R., Rao, J., and Bandillo, N. 2022. Multi-trait genomic prediction improves selection accuracy for enhancing seed mineral concentration in pea. *The Plant Genome*. doi: 10.1002/tpg2.20260.
5. **Bari, M.A.A.**, Zheng, P., Viera, I., Worral, H., Szwiec S., Ma, Y., Main, D., Coyne, C. J., McGee, R., and Bandillo, N. 2021. Harnessing genetic diversity in the USDA pea germplasm collection through genomic prediction. *Frontiers in Genetics*.
6. Hoque, M., Uddin, M.N., Aktar, M., Rasel, M., and **Bari, M.A.A.** 2021. Responses to maize genotypes to the first phase of salt stress in relation to their photophysiology, water use efficiency and total soluble phenolics. *J Bangladesh Agril Univ* 19(1): 14-21. <https://doi.org/10.5455/jbau.46043>.
7. Talukder, J., **Bari, M.A.A.**, Islam, M. M., Islam, M. Jewel, R., and Jahan, I. 2019. Traits association, path analyses and multiple linear regression estimates in rice (*Oryza sativa* L.). *Fundam Appl Agric* 4(4): 1019-1024. doi: 10.5455/faa.60679.
8. Uddin, M.N., Hoque, M.I.U., Monira, S., and **Bari, M.A.A.** 2019. Gas exchange and chlorophyll fluorescence parameters in four maize genotypes influenced by first phase of salt stress. *Progressive Agriculture* 30: 26-32.
9. Roy, P.R., Haque, M.A., Ferdausi A., and **Bari, M.A.A.** 2018. Genetic variability, correlation and path co-efficients analyses of selected maize (*Zea mays* L.) genotypes. *Fundam Appl Agric* 3(1): 382-389. doi: 10.5455/faa.284502.

10. Rahman, M., Hoque, A., Hossain, M. A., **Bari, M.A.A.** 2018. Variability and traits association analyses in maize (*Zea mays* L.) genotypes. The Agriculturists 15(2):101-114(2017). doi: <http://dx.doi.org/10.3329/agric.v15i2.35473>.
11. Ferdoush, A., Haque, M.A., Rashid M.M., and **Bari, M.A.A.** 2017. Variability and traits association in maize (*Zea mays* L.) for yield and yield associated characters. J Bangladesh Agril Univ 15(2): 193–198. doi: 10.3329/jbau.v15i2.35062.
12. Akram, S., Siddiqui, M.N., Hussain, B.M.N., **Bari, M.A.A.**, Mostofa, M.G., Hossain, M. A., and Tran, L.S. P. 2017. Exogenous glutathione modulates salinity tolerance of soybean [*Glycine max* (L.) Merrill] at reproductive stage. J Plant Growth Regul. DOI 10.1007/s00344-017-9691-9.
13. **Bari, M.A.A.**, and Carena M.J. 2016. Can expired proprietary maize (*Zea may* L.) industry lines be useful for short-season breeding programs? II. agronomic traits. Euphytica. 207: 69-77.
14. **Bari, M.A.A.**, Pereira, M., and Carena M.J. 2016. Identification of heterotic patterns between expired proprietary, NDSU, and industry short-season maize inbred lines. Crop breed. & appl. biotechnology. 16: 274-281.
15. Carena, M.J., and **Bari, M.A.A.** 2016. Germplasm and heterotic groups. In: Corn Breeding. AFV Editorial.
16. Akram, S., Hussain, B.M.N., **Bari, M.A.A.**, Burritt, D.J., and Hossain, M.A. 2016. Genetic variability and association analysis of **soybean** (*Glycine max* (L.) Merrill) for yield and yield attributing traits. Plant Gene and Trait. 7 (13):1-11.
17. Hasan, M.D., **Bari, M.A.A.**, Burritt, D.J., and Hossain, M.A. 2016. Genetic variability and traits association analysis of tomato (*Lycopersicon esculentum* L.) genotypes for yield and quality attributes. Universal Journal of Plant Science 4(3): 23-34.
18. **Bari, M.A.A.**, and Carena M.J. 2015. Can expired proprietary maize (*Zea may* L.) industry lines be useful for short-season breeding programs? I. grain quality and nutritional traits. Euphytica. 202: 157-171.
19. Tuhina-Khatun, **Bari, M.A.A.**, Zaman, M.A., Begum, H., Akter, S. 2010. Heterosis estimates in F₂ diallel population of spring wheat at two different cultural conditions. Bangladesh Journal of Agricultural Research. 35(3): 413-422.
20. Masum, M.M.I., **Bari, M.A.A.**, and Meah, M.B. 2009. Variation in disease reaction of F₃ eggplant for resistant to phomopsis blight and fruit rot. Bangladesh J. Aric. Sci. 36(1): 31-37.
21. Kamal, A.H.M., Alam, M.A., Pervin, N., Paul, S.K. and **Bari, M.A.A.** 2008. Effects of abscisic acid on callus induction and regeneration of some wheat cultivars in Bangladesh. Bangladesh J. Prog. Sci. & Tech. 6(1): 65-68.
22. Tuhina-Khatun, M., Newaz, M.A. and **Bari, M.A.A.** 2007. Genetic Analysis of F₂ diallel population in spring wheat under interacting cultural environments. Ann. Bangladesh Agric.11(2): 45-51.
23. Masum, M.M.I., Meah, M.B. and **Bari, M.A.A.** 2007. Genetics of disease resistance of eggplant in F₂ generation. Bangladesh Journal of Crop Science. 18(1): 215-220.
24. Masum, M.M.I., **Bari, M.A.A.**, and Meah, M.B. 2007. Genetic analysis of yield contributing characters of eggplant in F₂ generation. Bangladesh Journal of Crop Science. 18(1): 49-54.
25. Tuhina-Khatun, M., Newaz, M.A. and **Bari, M.A.A.** 2007. Combining ability and heritability estimates in F₂ diallel population of spring wheat under interacting environments. Bangladesh J. Agril. Sci. 34(1):75-82.
26. **Bari, M.A.A.** and Newaz, M.A. 2006. Mean performances and components of variation in spring wheat under two sowing dates. Bangladesh J. Agril. Sci. 33(2):189-195.
27. **Bari, M.A.A.** and Newaz, M.A. 2006. Genetic control of yield and yield contributing characters in spring wheat under two sowing dates. Progress. Agric. 17(1):73-79.
28. **Bari, M.A.A.** and Newaz, M.A. 2005. Combining ability and heterosis for yield and yield contributing characters in spring wheat under two sowing dates. Bangladesh J. Crop Sci.16 (2):361-367.

Presentation Abstracts:

1. **Bari, M. A. A.**, Choton J., C., Gina, C., Sexton-Bowser, S., Witt, T., Raymundo, R., Morris, G., and Felderhoff, T. (2024). ML Predictive Analytics by Incorporating Phenomics, Genomics, and Envirotyping to Breed Climate Resilient Water Use Efficient Sorghum. ASA, CSSA, SSSA International Annual Meeting, Nov.9-13, 2024, San Antonio, TX.

2. **Bari, M. A. A.**, Bakshi, A., Witt, T., Caragea, D., Jagadish, K., and Felderhoff, T. (2024). Deep learning to estimate sorghum yield with uncrewed aerial system imagery. 2024. 16th International Conference on Precision Agriculture, July 21-24. 2024, Manhattan, KS.
3. **Bari, M. A. A.**, Sexton-Bowser, S., Witt, T., and Felderhoff, T. (2023). DropXL sorghum: a toolbox for water smart crop seed technologies. 2023 Governor's Water Conference on the Future of Water in Kansas, Nov. 15-16, 2023, Manhattan, KS.
4. **Bari, M. A. A.**, Sexton-Bowser, S., Gina, C., Witt, T., Raymundo, R., Marla, S., Morris, G., and Felderhoff, T. (2023). DropXL sorghum development using drone imagery and data-driven approaches. ASA, CSSA, SSSA International Annual Meeting, Oct.29-Nov.1, 2023, St. Louis, MO.
5. **Bari, M. A. A.**, Sexton-Bowser, S., and Felderhoff, T. (2022). DropXL sorghum: developing water optimized sorghum for kansas using drone imagery and data driven approaches. 2022 Governor's Water Conference on the Future of Water in Kansas, Nov. 15-17, 2022, Manhattan, KS.
6. **Bari, M. A. A.**, Fonseka, D., Stenger, J., Worrall, H., Morales, M. A., Piche, L., Flores, P., Bandillo, N., & Pasche, J. S. (2021) High-Throughput phenotyping for genetic dissection and prediction of aphanomyces root rot in pea. ASA, CSSA, SSSA International Annual Meeting, Nov. 7-10, 2021, Salt Lake City, UT. <https://scisoc.confex.com/scisoc/2021am/meetingapp.cgi/Paper/135427>
7. **Bari, M. A. A.**, Fonseka, D., Stenger, J., Worrall, H., Piche, L., Wunsch, M., Flores, P., Pasche, J., and Bandillo, N. Optimizing phenomics-driven disease ratings in pulse crops under greenhouse and field conditions. ASA, CSSA, and SSSA International Annual Meetings. Nov. 9-13, Virtual Annual Meeting 2020.
8. **Bari, M.A.A.**, and Carena, M.J. 2013. Utilization of expired industry lines for US northern corn breeding program. NCCC 167 Meeting, March 13-14, 2013, St. Charles, IL.
9. **Bari, M.A.A.**, and Carena, M.J. 2013. Combining ability analysis of expired proprietary short-season maize lines. 29th Plant Sciences Graduate Student Symposium, Mar. 22-23, 2013, NDSU, Fargo, ND.
10. **Bari, M.A.A.**, and Carena, M.J. 2012. Combining ability analysis of expired proprietary short-season maize lines. 28th Plant Sciences Graduate Student Symposium, Mar. 23-24, 2012, University of Manitoba, Winnipeg, Canada.

Poster Abstracts:

1. **Md. Abdullah Al Bari**, Aliva Bakshi, Swaraj Pramanik, Jahid Chowdhury Choton, Trevor Witt, Doina Caragea, Krishna Jagadish, and Terry Felderhoff. 2024. Computer vision and deep learning integrated with aerial imagery to estimate sorghum yield. AI and the Future Symposium, Manhattan, KS. Oct. 15-17, 2024.
2. **Md. Abdullah Al Bari**, Gina Cerimele, Sarah Sexton-Bowser, Trevor Witt, Rubi Raymundo, Sandeep Marla, Geoff Morris, and Terry Felderhoff. 2024. Harnessing UAS imagery for precision phenotyping of water-use efficiency traits in sorghum. The Sorghum Improvement Conference of North America (SICNA) at Oklahoma City, OK. April 2- 4, 2024.
3. **Md. Abdullah Al Bari**, Aliva Bakshi, Trevor Witt, Doina Caragea, Krishna Jagadish, and Terry Felderhoff. 2024. Computer vision and deep learning integrated with aerial imagery to estimate sorghum yield. The Sorghum Improvement Conference of North America (SICNA) at Oklahoma City, OK. April 2- 4, 2024.
4. **Md. Abdullah Al Bari**, Dimitri Fonseka, John Stenger, Hannah Worrall, Lisa Piche, Mario Morales, Paulo Flores, Julie Pasche and Nonoy Bandillo. 2022. High-throughput phenotyping for genetic dissection of *Aphanomyces* root rot in pea. Northern Pulse Growers Association Convention, at Minot, ND. Jan 24-25, 2022.
5. **Md. Abdullah Al Bari**, Dimitri Fonseka, John Stenger, Hannah Worrall, Lisa Piche, Michael Wunsch, Paulo Flores, Julie Pasche and Nonoy Bandillo. 2021. High-throughput phenotyping derived disease rating towards genetic dissection and prediction in pea (*Pisum sativum*). Northern Pulse Growers Association Virtual Convention. Jan 19-21, 2021.
6. **Md. Abdullah Al Bari**, Schichen Zhang-Biehn, Allan K. Fritz, Guorong Zang and Jesse Poland. 2019. Validation of hypothesis driven predictions to explore grain and flour protein genetics of wheat

at KSU Wheat breeding program. The 4th Biennial Plant Breeding and Genetics Symposium, April 4, 2019, Kansas State University, Manhattan, KS.

7. **Bari, M.A.A.**, Sharma, S., and Carena, M.J. 2014. Should public breeding programs spend efforts on expired proprietary (ex PVP) Maize (*Zea mays* L.) industry lines? Nov 3, 2014, Long Beach, CA.
8. **Bari, M.A.A.**, and Carena, M.J. 2013. Combining ability analysis of expired proprietary short-season maize lines. 55th Maize Genetics Conference, March 14-17, 2013, St. Charles, IL.
9. **Bari, M.A.A.**, and Carena, M.J. 2012. Utilization of industry lines in U.S. northern Corn breeding programs. Corn Utilization and Technology Conference, June 4-6, 2012, Indianapolis, IN.

Professional Service

Reviewer:

- The Plant Genome, PLOS ONE, Genes, Industrial Crops and Products, Crop Science, and Agronomy Journal
- Foundation for Food & Agriculture Research (FFAR) grants for Seeding Solutions 2023 RFA
- ASA-CSSA-SSSA Peer Review Fellowship for hands-on peer review

Professional Societies:

- American Society of Agronomy (ASA)
- Crop Science Society of America (CSSA)
- Plant Breeding and Genetics Society of Bangladesh (PBSB), Lifetime Member