

Mohammad Shamshad

PDRA, Punjab Agricultural University, India

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Plant breeder and Geneticist with extensive experience in R-programming, SAS, bioinformatics, data analysis, trait phenotyping, genotyping, breeding methodology, quantitative techniques, germplasm development and genetic mapping.

Education

Ph.D. in Plant Breeding and Genetics (Jan 2016-Sep. 2019)

Punjab Agricultural University, Ludhiana, India.

- Dissertation: “*Genetic and physiological basis of nitrogen uptake and utilization in wheat (Triticum aestivum L.)*”
- Collaboration with University of Bristol, UK and University of Nottingham, United Kingdom
- Major: Plant Breeding and Genetics
- Minor: Agricultural Biotechnology

M.Sc. in Plant Breeding & Genetics; (July 2012-Nov. 2014)

Punjab Agricultural University, Ludhiana, India

- Dissertation: “Assessment of morphological and genetic diversity and its association with heterosis and F1 performance in sunflower (*Helianthus annuus L.*)”
- Major: Plant Breeding and Genetics
- Minor: Agricultural Biotechnology

B.Sc. in Agriculture (Plant Science), (July-2008-June 2012)

Punjab Agricultural University, Ludhiana, India

- All Subject related Agriculture Prescribe by the ICAR, India

Achievements/Scholarships/Awards

- Ph.D. Fellowship under the “Indo-UK project for nitrogen use efficiency-INEW (<https://www.cerealsdb.uk.net/cerealgenomics/INEW/>)” for nitrogen use efficiency in wheat.
- Qualified ICAR-National Eligibility Test (NET) conducted by Agricultural Scientist Recruitment Board (ASRB), in Genetics and Plant Breeding during 2014,2016
- Travel Grant to the University of Nottingham, Rothamsted Research Station, and the University of Bristol, United Kingdom.
- Travel Grant to attend Cereal-DB work at the University of Bristol, UK.

Professional Experience

Post Doctorate Research Associate (TIGR²ESS)

August 2020 to present

Plant Breeding & Genetics, Punjab Agricultural University

- **Responsibilities:**

- o Pre-breeding and germplasm characterization using novel genomics, phenomics, and statistical tools for irrigated, rainfed, and hybrid wheat breeding programs.
- o Development of core panels, identification of potential trait gaps in terms of phenotypic variation, and building novel strategies to enrich for missing phenotypic variations.
- o Conducted extensive field trials, crossing, phenotyping and data collections across multiple environments over the years
- o Double haploid breeding in wheat using wheat × Maize crosses

Junior Research Fellow

August 2019 to July 2020

Plant Breeding & Genetics, Punjab Agricultural University

- **Responsibilities:**

- o Quantitative genetic analysis of field trials.
- o Perform genome-wide analysis and genomic predictions for the nitrogen use efficiency
- o Making of crosses in wheat for various objectives viz. grain yield, heat, drought, salt and stripe rust resistance

Research Assistant

Jan 2015 to Dec 2015

Department of Plant Breeding and Genetics, PAU, Ludhiana, India

- **Responsibilities:**

- o Development of the germplasm and core panel for the breeding objective for yield, quality and quantity oils
- o Conducted extensive field trials, crossing of A, B and R lines, and data collections of the Advanced variety trials

Graduate Experience:

Scientific Associate

June to August 2018

School of Biosciences, University of Nottingham, United Kingdom

- Hydroponics and shovelomics for the root system architecture
- Image's analysis using RootNav and ImageJ ObjectJ
- [Dr. John Foulkes](#)

Student Exchange

September to October 2018

School of Biosciences, University of Bristol, UK

- 35K array of genotyping
- SNPs Calling
- QTLs mapping for NUE

- [Professor Keith Edwards](#)

Ph. D (INEW International Fellow and Graduate Research Assistantship)

January 2016 to July 2019

- Focused on the development and evaluation of the RIL mapping population are related to nitrogen uptake and utilization.
- Development of high-density linkage map based on Breeder array of 35K SNPs.
- Genome-wide QTL mapping for various agro-physiological, nitrogen uptake, and utilization efficiency traits phenotyped across a wide range of environments.
- High-throughput phenotyping of wheat and soybean using newly developed phenotyping platforms.
- Genome selection/prediction in the Punjab Agricultural University wheat breeding program.
- gained proficiency in statistical analysis and programming, including the Unix operating system, Perl language, GBS data analysis, and statistical analysis using R packages and SAS software.
- Extensive field trials, crossing, phenotyping, and data collection across multiple environments for three years.
- Multi-environment phenotypic data were analyzed using the ASReml package in R and incorporating spatial corrections using mixed linear models and generating variance components.
- BLUP/BLUE estimates for genomic selection and QTL mapping.
- Molecular mapping of nitrogen uptake and utilization efficiency in wheat.

Graduate Research Assistant (M.Sc.)

July 2012 to Nov. 2014

Department of Plant Breeding and Genetics, PAU, Ludhiana, India

- Identification of potential restorers for newly developed temperate CMS lines and heterotic combinations.
- Association of morphological and genetic diversity with heterosis and combining ability

Publications:

Preliminary dissection of grain yield and related traits at differential nitrogen levels in diverse pre-breeding wheat germplasm through association mapping

Peer-Reviewed Articles

Sharma, H., Singh, S., **Shamshad, M.**, Padhy, A.K., Kaur, R., Kashyap, L., Srivastava, P., Mavi, G.S., Kaur, S., Sharma, A., Sohu, V.S., Bains, N.S., 2022. Variability in iron, zinc, phytic acid and protein content in pre-breeding wheat germplasm under different water regimes. Plant Growth Regul. <https://doi.org/10.1007/s10725-022-00943-5>

Sharma, A., Arif, M. A. R., **Shamshad, M.**, Rawale, K. S., Brar, A., Burgueño, J., et al. (2022). Preliminary Dissection of Grain Yield and Related Traits at Differential Nitrogen Levels in Diverse Pre-Breeding Wheat Germplasm Through Association Mapping. Mol. Biotechnol. doi: [10.1007/s12033-022-00535-8](https://doi.org/10.1007/s12033-022-00535-8).

- Padhy, A. K., Kaur, P., Singh, B., Kaur, R., Bhatia, S., **Shamshad, M.**, ... Sharma, A. (2022). In silico characterization of Thinopyrum elongatum-derived PsyE1 gene and validation in 7D/7E bread wheat introgression lines open avenues for carotenoid biofortification in wheat. *Cereal Research Communications*, (0123456789). Retrieved from <https://doi.org/10.1007/s42976-022-00279-w>
- Gudi, S., Saini, D. K., Singh, G., Halladakeri, P., Kumar, P., **Shamshad, M.**, ... Sharma, A. (2022). Unravelling consensus genomic regions associated with quality traits in wheat using meta-analysis of quantitative trait loci. *Planta*, 255(6), 1–19. Retrieved from <https://doi.org/10.1007/s00425-022-03904-4>
- Gupta, P. K., Balyan, H. S., Chhuneja, P., Jaiswal, J. P., Tamhankar, S., Mishra, V. K., ... Vishwakarma, M. K. (2022). Pyramiding of genes for grain protein content, grain quality, and rust resistance in eleven Indian bread wheat cultivars: a multi-institutional effort. *Molecular Breeding*, 42(4), 1–16. Retrieved from <https://doi.org/10.1007/s11032-022-01277-w>
- Kaur, Sarabjit, **Shamshad, M.**, Jindal, S., Kaur, A., Singh, S., sharma, A., & Kaur, S. (2022). RNA-Seq-Based Transcriptomics Study to Investigate the Genes Governing Nitrogen Use Efficiency in Indian Wheat Cultivars. *Frontiers in Genetics*, 13(March), 1–15. Retrieved from <https://doi.org/10.3389/fgene.2022.853910>
- Kaur, Sukhjit, Suhalia, A., Sarlach, R. S., **Shamshad, M.**, Singh, P., Grover, G., ... Sharma, A. (2022). Uncovering the Iranian wheat landraces for salinity stress tolerance at early stages of plant growth. *Cereal Research Communications*, (0123456789). Retrieved from <https://doi.org/10.1007/s42976-022-00245-6>
- Sharma, A., Ankita, **Shamshad, M.**, Kaur, S., Singh, A., Srivastava, P., ... Sohu, V. S. (2021). SALT STRESS GENOTYPIC RESPONSE: RELATIVE TOLERANCE OF WHEAT CULTIVARS TO SALINITY. *Agricultural Research Journal*, 58(6), 974–982. Retrieved from <https://doi.org/10.5958/2395-146X.2021.00138.1>
- Shamshad, M.** and Dhillon, S. K. (2016). Morphological and molecular genetic diversity analyses in *Helianthus annuus* (L.). *Electronic Journal of Plant Breeding*, 7(4), 1216–1223. Retrieved from <https://doi.org/10.5958/0975-928X.2016.00169.1>
- Shamshad, M.**, Dhillon, S. K., & kaur, G. (2016). Heterosis for oil content and oil quality in sunflower (*Helianthus annuus* L.). *Current Advances in Agricultural Sciences(An International Journal)*, 8(1), 44. Retrieved from <https://doi.org/10.5958/2394-4471.2016.00010>.
- Shamshad, M.**, Dhillon, S. K., Tyagi, V., Akhatar, J. (2014). Assessment of Genetic Diversity in Sunflower (*Helianthus annuus* L.) Germplasm. *International Journal of Agriculture and Food Science Technology*, 5(4), 267–272. Retrieved from <http://www.ripublication.com/ijafst.htm>
- Shamshad, M.**, Dhillon, S. K. (2014). Magnitude of combining ability for seed yield and oil content in sunflower (*Helianthus annuus* L.). In *National Symposium on Crop Improvement for Inclusive Sustainable Development* (Vol. 10, pp. 248–250). Retrieved from <https://doi.org/10.5958/0975-928X.2017.00014.X>

Book Chapters

Shamshad, M. and Sharma, A . (2018). The usage of genomic selection strategy in plant breeding. In: Yelda Ozden C (ed) Next Generation Plant breeding. Pp 93-108. Intech Publisher, London, UK. Retrieved from <http://dx.doi.org/10.5772/intechopen.76247>

Sharma, A., **Shamshad, M.**, Kaur, S., Srivastava, P., Mavi, G.S., Sohu, V.S. (2022). Tackling a Cereal Killer on the Run: Unending Fight Between Wheat Breeding and Foliar Rusts. In: GP, et al. New Horizons in Wheat and Barley Research. Springer, Singapore. https://doi.org/10.1007/978-981-16-4449-8_10.

Thesis PhD

<https://krishikosh.egranth.ac.in/handle/1/5810137744>

Talks

- **Hydroponics and shovelomics for the root system architecture**
October 26, 2018
Invited Talk at PBG, PAU
- **SNP chip based High-Density Linkage Map and its Application to QTL Mapping of nitrogen uptake and utilization in Bread Wheat**
October 03, 2018
Invited Talk at Life Science, School of Bioscience, University of Bristol, UK
- **Breaking yield ceiling in wheat: Genomic and molecular approaches**
April 20, 2017
Ph.D. Seminar talk at PBG, PAU
- **Evolution of free threshing habit in wheat**
November 04, 2016
Ph.D. Seminar Talk at PBG, PAU
- **Does genomic selection strategies help improve crop plants?**
May 16, 2016
Invited Talk at PBG, PAU
- **Correlation and its application in Crops**
October 03, 2013
M.S Lecture Talk PBG, PAU
- **Overcoming the barriers to alien gene transfer in Crop Improvement**
September 27, 2013
M.S seminar talk at PBG, PAU

Professional Trainings

- The series of next generation genomics and integrated breeding for crop improvement (VII-NGGIBCI) on genomics for food, health and nutrition, ICRISAT, Hyderabad. May 14, 2020 (Virtual)
- General assembly/training to PDRA and early career researchers, International Crop Research Institute for Semi-Arid Tropics (ICRISAT), Hyderabad, India. January 19-25, 2020,

- Scientific exchange to learn shovelomics and hydroponics for the root system architecture School of Biosciences University of Nottingham, Sutton Bonington, United Kingdom (UK).
- Workshop on Precision nitrogen nutrition in wheat: Integrating genetics and precision agronomy for improving nitrogen use efficiency, BISA, Ludhiana, India. March 1 -5 March 2018.
- Workshop on CerealsDB, Life Science, School of Bioscience, University of Bristol, United Kingdom. 18th -19 September 2018
- Scientific Student Exchange University of Bristol, UK: Use of advance generation sequence platforms and molecular work.
- workshop on Wheat genomic data analysis for improvement in nitrogen use efficiency ICAR- National Bureau of plant genic resources (NBPGR), New Delhi, India. February 27 to March 2, 2019
- Short-term bioinformatics training (RNA-Seq and DNA-seq). ArrayGen Technologies, India; Pune. 23 Oct-21 Nov. 2018.
- Experience in raising *Cajanus cajan* (Arhar) and *Triticum aestivum* (Wheat) crops at the field scale during Practical Crop Production Training with first-hand information on crop production and protection technologies.
- Work experience of crossing Wheat, Rice, Chickpea, Pigeon pea, field pea, Maize and Sunflower.

Posters and Conferences

- **Shamshad M**, Dhillon S K, Tyagi V and Singh S (2013) Studies on sunflower (*Helianthus annuus* L.) germplasm evaluation for drought tolerance. Pp 109-10, abstracted in Indraprastha International Conference on Biotechnology, October 22-25, 2013, Guru Gobind Singh Indraprastha University, New Delhi, India.
- **Shamshad M**, Tyagi V and Dhillon S K (2014) Estimation of drought susceptibility index in sunflower (*Helianthus annuus* L.) germplasm. Pp 97, abstracted in National Seminar on Plant Biotechnology: Challenges and Opportunities in 21st Century, March 03-04, 2014, Jamia Hamdard, New Delhi, India.
- Tyagi V, Dhillon S K, **Shamshad M** and Singh S (2013) Assessment of response of sunflower (*Helianthus annuus* L.) genotypes to water stress. Pp 108, abstracted in Indraprastha International Conference on Biotechnology, October 22-25, 2013, Guru Gobind Singh Indraprastha University, New Delhi, India.
- Tyagi V, Singh S, **Shamshad M** and Dhillon S K (2013) Effect of moisture stress on correlations between yield and component traits in sunflower. Pp 108-09, abstracted in Indraprastha International Conference on Biotechnology, October 22-25, 2013, Guru Gobind Singh Indraprastha University, New Delhi, India.
- Tyagi V, Dhillon S K, **Shamshad M** and Akhatar J (2014) Genetic diversity in sunflower (*Helianthus annuus* L.) germplasm under water stress environment. Pp 98, abstracted in National Seminar on Plant Biotechnology: Challenges and Opportunities in 21st Century, March 03-04, 2014, Jamia Hamdard, New Delhi, India.
- **Shamshad M**, Sharma A, Srivastava P, Kaur S, Brar A, Bains N S (2019) Genetic variability for root traits in relation to nitrogen use efficiency in structured

population of wheat (*T. aestivum*) Pp 133, abstracted in International Conference Genomics and Breeding for Crop Improvement, December 04-06, 2019 Chaudhary Charan Singh University, Meerut, UP, India.

- Ankita, Sharma A, Srivastava P, Kaur S, **Shamshad M**, Kaur A, Sarlach R S, Sharma H, Singh S (2019) Morphological characterization of Mexican wheat landraces under simulated salinity stress, Pp 109, abstracted in International Conference Genomics and Breeding for Crop Improvement, December 04-06, 2019 CCS University, Meerut, UP, India.
- Kaur S, Sharma A, Ankita, Srivastava P, **Shamshad M**, Sarlach R S, Sharma H, Singh S (2019) Yield component and their association for enhancing grain yield in Iranian wheat landraces under saline field conditions, Pp 154, abstracted in International Conference Genomics and Breeding for Crop Improvement, December 04-06, 2019 CCS University, Meerut, UP, India.
- Kumar A, Sharma A, Sharma H, **Shamshad M**, Srivastava P, Mavi G S, Kaur S, Chhuneja P, Rajput R, Pandey A and Sohu V S (2022). Yellow pigment enriched biofortified wheat for tackling micronutrient deficiencies Pp 45. Abstracted in 1st International Symposium on “Cereals for Food Security and Climate Resilience”. January 18-20, 2022, Indian Institute of wheat and Barley, Karnal, India
- Sharma A, **Shamshad M**, Sharma H, Tanin M J, Kumar P, Singh S, Srivastava P, Mavi G S, Bala R, Kaur J, Kaur S, Chhuneja P, Kaur A and Sohu V S (2022). Combining nutritional and quality traits in wheat: A newer mandate for wheat breeders. Pp 46. Abstracted in 1st International Symposium on “Cereals for Food Security and Climate Resilience”. January 18-20, 2022, Indian Institute of wheat and Barley, Karnal, India
- Rushali, Srivastava P, Kumar S, Ayoubi H, Ankita, Sarao L, **Shamshad R**, Sharma H (2022) Evaluation and utilization of breeding lines having diverse dwarfing genes. Pp 50. Abstracted in 1st International Symposium on “Cereals for Food Security and Climate Resilience”. January 18-20, 2022, Indian Institute of wheat and Barley, Karnal, India
- Gudi S, Sharma A, **Shamshad M**, Sharma H, Singh S, Srivastava P, Mavi G S and Sohu V S (2022). Field-based, low-cost speed breeding technique to develop wheat (*Triticum aestivum*) having enhanced water use efficiency and early heat stress tolerance. Pp 38. Abstracted in 1st International Symposium on “Cereals for Food Security and Climate Resilience”. January 18-20, 2022, Indian Institute of wheat and Barley, Karnal, India.
- Sharma H, **Shamshad M**, Gudi S, Tanin M J, Kumar P, Sharma A, Singh S, Srivastava P, Mavi G S and Sohu V S (2022) Enhancing bioavailability of micronutrients by reducing phytic acid content in wheat. Pp 74. Abstracted in 1st International Symposium on “Cereals for Food Security and Climate Resilience”. January 18-20, 2022, Indian Institute of wheat and Barley, Karnal, India.
- **Shamshad M**, Sharma A, Singh J, Srivastava P, Kaur R and Kaur H (2022). Agronomic/physiological characterization of spring wheat genotypes for various nitrogen use efficiency traits. Pp 80. Abstracted in 1st International Symposium on “Cereals for Food Security and Climate Resilience”. January 18-20, 2022, Indian Institute of wheat and Barley, Karnal, India.

- Kaur S, **Shamshad M**, Sharma A, Kaur A and Kaur S (2022). RNA-seq based transcriptomics analysis of roots and shoots of wheat cultivar in response to low nitrogen stress. Pp 173. Abstracted in Ist International Symposium on “Cereals for Food Security and Climate Resilience”. January 18-20, 2022, Indian Institute of wheat and Barley, Karnal, India.

Skills

Quantitative Skills

- Genotyping-by-sequencing data analysis and SNP calling
- Trained to perform RNA-seq data analysis
- Quantitative Genetics
 - QTL Mapping: R/qtl, R/ASMap, IciMapping etc.
 - Genome-wide Association Mapping: Plink, TASSEL, BGLR, rrBLUP, GAPIT, FarmCPU, and others.
 - Genomic selection: BGLR and rrBLUP.
- Statistics
 - R
 - SAS
 - ASReml
 - Python

Wet Lab Skills

- DNA extractions, PCR, real-time PCR, electrophoresis, SSR marker and KASP marker genotyping

Computational Skills

- Operating Systems: LINUX, OS X, Windows
- Latex and R Markdown

Field Experiment Skills

- Field designs
- Crossing
- Agronomic management
- DH production

References and additional information available upon request