Waseem Hussain

Postdoctoral Research Associate
Department of Agronomy and Horticulture
University of Nebraska Lincoln USA

321 Plant Science Hall
Lincoln, NE 68583-0915
waseem.hussain@unl.edu
402-830-5218
Website: https://whussain2.github.io/

Research Interests

Incorporating quantitative genetics, genomics, bioinformatics, statistics and high-throughput phenotyping to bridge the gap between phenotype and genotype. The primary research areas I want to focus is a characterization of alleles, cloning and isolation of genes, and integration through marker-assisted breeding. Identification and mapping of genomic regions (via linkage and association) with emphasis on abiotic and biotic stresses, and integration of genomic selection/predictions in cultivar and hybrid development using advanced genomic and phenotyping tools.

Education

Ph.D. in Agronomy (Plant Breeding & genetics); May 2017

University of Nebraska Lincoln USA

- Dissertation: "*Development of High-Density Linkage Map and QTL Mapping for Agronomic Traits in Bread Wheat Evaluated Across Multiple Rainfed Environments*"
- Advisor: Prof. P. Stephen Baenziger

M.S. in Agriculture (Plant Breeding & Genetics); Dec. 2011

Shere-I-Kashmir Univ. of Agric. Sci. and Technol. Kashmir, India

- Dissertation: "*Studies on heterosis and combining ability for hybrid rice development under temperate conditions*"
- Advisor: Dr. Gulzar Singh Sangehra

B.S. in Agriculture, June 2009

Sher-I-Kashmir Univ. of Agric. Sci. and Technol. Kashmir, India

Research Experience

Postdoctoral Research Associate

March 2018 to Current:
Department of Agronomy and Horticulture, University of Nebraska - Lincoln

- Supervisors: Gota Morota and Harkamal Walia

- Responsibilities:
    - Quantitative genetic analysis of longitudinal high-throughput image data of night temperature stress in wheat and rice.
    - Perform genome-wide analysis and genomic predictions of high-throughput image data combined with high dimensional genomic, transcriptomic and metabolomics data.
    - Modelling variance-heterogeneity in genome-wide association studies using novel statistical tools.
    - Develop applications related to quantitative genetic studies.

Research Associate Scientist-II (Wheat Breeder)
May 2017 to December 2017:
Maharashtra Hybrid Seed Company (MAHYCO), Aurangabad, Jalna, India

- The goal was to develop wheat lines and hybrids using advanced statistical and genomics tools.

Ph. D (ICAR International Fellow and Graduate Research Assistantship)
January 2014 to April 2017:

- Focused on the development and evaluation of RIL mapping population related to drought tolerance.
- Development of high-density linkage map based on SNPs derived from genotyping by sequencing.
- Genome-wide QTL mapping for various agro-physiological traits phenotyped across a wide range of environments.
- High-throughput phenotyping in wheat and soybean using newly developed phenotyping platforms.
- Genome selection/predictions in Nebraska Wheat breeding program.
- Gained proficiency in statistical analysis and programming including Unix operating system, Perl languages, GBS data analysis, and statistical analysis using R packages and SAS software.
- Conducted extensive field trials, crossing, phenoyping and data collections across multiple environments for the four years.
- Analyzed multi-environment phenotypic data in ASREML package in R and incorporating spatial corrections using mixed linear models and generate variance components.
- BLUP/BLUE estimates for genomic selections and QTL mapping.
- Molecular mapping of Tan spot resistance in wheat.

Research Fellow (INSPIRE Fellowship)
December 2011 to December 2013
Agricultural University, CSKHPKV, Palampur India.

- Diversity analysis in oats, screening and molecular mapping of powdery mildew resistance in oats.
- Double haploid breeding in wheat using *Imperata cylindrica* grass.

Graduate Research Assistant (M.S.)
June 2009 to December 2011

- Identification of potential restorers for newly developed temperate CMS lines and identify the heterotic combinations.

Publications

Under Preparation

- Hussain, W., Walia, H., Jarquin, D., and Morota, G. 2019. Variance-heterogeneity genome-wide mapping for cadmium in wheat (*Triticum Aestivum* L.) revealed novel genomic regions and candidate genes. Target Journal: *BMC Plant Biology.*
- Hussain, W., Belamkar, V., Guttieri, M.J., Poland, J and Baenziger, P.S. 2019. Genotyping-by-sequencing derived high-density linkage map reveled novel genomic loci and candidate genes for plant height in wheat (*Triticum Aestivum* L.) Target Journal: *The Plant Journal.*

Peer-Reviewed articles

- Kariyawasam, G. K., Hussain, W., Easterly, A., Guttieri, M., Belamkar, V., Poland, J., et al. 2018. Identification of quantitative trait loci conferring resistance to tan spot in a bi-parental population derived from two Nebraskan hard red winter wheat cultivars. *Mol Breeding*. 38.

- Hussain, W., Campbell, M., Walia, H., and Morota, G. 2018. ShinyAIM: Shiny-based application of interactive Manhattan plots for longitudinal genome-wide association studies. *Plant Direct*. 2: e00091.

- Sallam, A., Mourad, A. M. I., Hussain, W., and Stephen Baenziger, P. 2018. Genetic variation in drought tolerance at seedling stage and grain yield in low rainfall environments in wheat (*Triticum aestivum L.).* *Euphytica*. 214:169.

- Hussain, W., Guttieri, M. J., Belamkar, V., Poland, J., Sallam, A., and Baenziger, P. S. 2018. Registration of a bread Wheat recombinant inbred line mapping population derived from a cross between 'Harry' and 'Wesley'. *Journal of Plant Registrations*. 12:411–414.

- Hussain,W., Baenziger, P.S., Belamkar, V., Guttieri, M.J., Venegas, J.P., Easterly, A., Sallam, A., and Polland, Jesse. 2017. Genotyping-by-sequencing derived high-density linkage map and its application to QTL mapping of flag leaf traits in bread wheat. *Scientific Reports*.
- Belamkar, V., Guttieri, M. J., Hussain, W., Jarquín, D., El-basyoni, I., Poland, J., et al. 2018. Genomic selection in preliminary yield trials in a winter wheat breeding program. *G3*: *Genes|Genomes|Genetics*. 8:2735–2747.
- Bai, G., Ge, Y., Hussain, W., Baenziger, P. S., and Graef, G. 2016. A multi-sensor system for high throughput field phenotyping in soybean and wheat breeding. *Computers and Electronics in Agriculture*. 128:181–192.
- Badiyal, A., Chaudhary, H. K., Jamwal, N. S., Bhatt, A. K., and Hussain, W. 2016. Comparative assessment of different auxin analogues on haploid induction in triticale x wheat derived backcross generations. *Agricultural Research Journal*. 53:157.
- Jamwal, N. S., Chaudhary, H. K., Badiyal, A., and Hussain, W. 2016. Factors influencing crossability among triticale and wheat and its subsequent effect along with hybrid necrosis on haploid induction. *Acta Agriculturae Scandinavica, Section B — Soil & Plant Science*. 66:282–289.
- Sood, V. K., Rana, I., Hussain, W., and Chaudhary, H. K. 2016. Genetic diversity of genus *Avena* from North Western-Himalayas using molecular markers. *Proc. Natl. Acad. Sci., India, Sect. B Biol. Sci.* 86:151–158.
- Chaudhary, L., Sood, V.K., and Hussain, W.2015. Genetic analysis for grain and forage yield and its component traits in genus *Avena* under North western Himalayas. *Range Management and Agroforestry.* 35:2.
- Badiyal, A., Chaudhary, H. k., Jamwal, N. s., Hussain, W., Mahato, A., and Bhatt, A. k. 2014. Interactive genotypic influence of triticale and wheat on their crossability and haploid induction under varied agroclimatic regimes. *Cereal Research Communications*. 42:700–709.

- Sanghera, G. S., and **Hussain, W**. 2012. **Heterosis and combining ability estimates using line x tester analysis to develop rice hybrids for temperate conditions.** *Notulae Scientia Biologicae*. 4:131–142.

- **Hussain, W**., and Sanghera, G. S. 2012. **Exploitation of heterosis in rice (*Oryza sativa L.*) using CMS system under temperate conditions.** *Electronic Journal of Plant Breeding*. 3(1):695-700.

- Sanghera, G. S., Wani, S. H., **Hussain, W**., and Singh, N. 2011. **Engineering cold stress tolerance in crop plants.** *Curr. Genomics*. 12, 30–43.

Book Chapters

- Rana,M., Sood, A., **Hussain, W**., Kaldate, R., Sharma, T.R., Gill, R.K., Kumar, S., Singh, S. (2019). In: Mohar Singh (eds), *Gene Pyramiding and Multiple Character Breeding*, Lentils: Potential Resources for Enhancing Genetic Gains, 2019, Pages 83-124.
- Sanghera, G.S., Wani, S.H., **Hussain, W**., and Singh, N.B. (2015). *Genetic Engineering for Cold Stress Tolerance in Crop Plants*. In book: Advances in Genome Science, Edition: Volume 4, Publisher: Bentham Science, Editors: Atta-ur-Rahman, pp. 173-201.
- Chaudhary, H.K., Kaila, V., Rather, S.A., Badiyal, A., **Hussain, W**., Jamwal, N.S., and Mahato, A. (2013). In: Pratap and J. Kumar (eds.), *Alien Gene Transfer in Crop Plants, Volume Achievements and Impacts*. Springer, pp 1-26.
- **Hussain, W**., Sanghera, G.S., Jamawal, N.S, and Badiyal,A. (2013). *Crop improvement through genomic interventions in sustainable way*. In: Malik CP, Sanghera GS and Sharma P(ed) Crop improvement: An integrated approach. MD Publications Pvt Ltd, New Delhi. pp 61-68. ISBN 978-81-7533-456-4.
- Dar, S.H., **Hussain, W**., and Sanghera, G.S. (2013). *Advances in hybrid rice technology through applications of novel technologies*. In: Malik CP, Sanghera GS and Sharma P(ed), Crop improvement: An integrated approach. MD Publications Pvt Ltd, New Delhi. pp 1-12.

Talks

- **ShinyAim: Shiny-Based Application of Interactive Manhattan Plots for Longitudinal GWAS.**
  November 06, 2018
  Conference Talk at ASA, CSSA Meeting (2018), Baltimore, Maryland

- Shiny Based Imaging GWAS Server.
  May 05, 2018
  Invited Talk at University of Nebraska Department of Statistics, Lincoln, Nebraska
- Genotyping-by-sequencing Derived High-Density Linkage Map and its Application to QTL Mapping of Flag Leaf Traits in Bread Wheat.
  April 05, 2017
  Invited Talk at Plant Breeding and Genetics Symposium, Manhattan, Kansas
- New tools to Understand and Improve Wheat in Genomics Era.
  February 10, 2017
  Invited Talk at Maharashtra Hybrid Seed Company (MAHYCO) India, Dawalwadi, Jalna, Maharashtra, India
- Development of High-Density Linkage Map in Wheat and Genome-Wide QTL Mapping for Plant Height.
  March 29, 2016
  Invited symposium Talk at Nebraska Plant Breeding Symposium 2017, Lincoln, Nebraska
- Association Mapping and its Role in Crop Improvement
  August 05, 2014
  Ph.D seminar talk at University of CSKHPKV, Palampur India Deptt. of Crop Improvement, Palampur, India
- Genetics and Molecular Basis of Heterosis in Crops
  June 03, 2009
  M.Sc Seminar Talk at University SKUAST-K, Deptt. of Plant Breeding & Genetics, Srinagar, J and K, India

Fellowships and Awards

- Open Science Grid User School Travel Grant Award 2018.
- Travel Grant Award Kansas State Plant Breeding Symposium-2017.
- International Conference on Quantitative Genetics Fellowship Award-2016.
- Best Oral Presentation Award, UNL Plant breeding Symposium-2016.
- Indian Council of Agricultural Research (ICAR)-International Fellowship (2014-2017).
- Inspire Fellowship (Ministry of Science & Technology, Department of Science & Technology, India (2012-2104).
- University Merit Certificate (M.Sc. Plant breeding &Genetics) (2011).
- Qualified ASRB National Eligibility Test 2012, 2013 and 2014 for Assistant Professorship

Professional Training

- Software Carpentry Workshop on computational skills, including task automation, version control, and modular programming. Learn Bash, Git and Python. Holland Computing Center, University of Nebraska, Lincoln. August 13 & 14, 2018.
- Open Science Grid (OSG) User School 2018: Workshop on High Throughput Computing and Running Large Scale Computing Applications at University of Wisconsin Madison. July 9-13.
- Work shop Series on Unix Shell, Git and use of HCC's High-Performance Computing, High Throughput Computing and Cloud computing resources. Holland Computing Center, University of Nebraska Lincoln. June 05-26, 2018.
- Short term bioinformatics training (RNA-seq and DNA-seq). ArrayGen Technologies, India, Pune. 23 Oct-21 Nov. 2017.
- Understanding genome-wide association studies and other big data biological applications. University of Nebraska, Lincoln. June 23-24, 2014.
- Fundamental writing skills workshop researchers. University of Nebraska, Lincoln. Sept 2015.
- Write Wining Grant Proposals, University of Nebraska, Lincoln, March 18, 2016.

Leadership Roles

- A representative of Department of Agronomy and Horticulture Safety Committee in the year 2015.
- Member of organizing a committee of UNL plant breeding symposium-2016.
- Hosted 2015- World Food Prize Nebraska Youth Institute in Department of Agronomy and Horticulture.
- Poster Judge (Undergraduate and Graduate) at University of Nebraska, Lincoln Spring Research Fair-2018.
- Poster Judge (Undergraduate) at ASA, CSSA Annual meetings in Baltimore, Maryland-2018.

Professional Memberships

- ASA, CSSA, and SSSA since June-2014.
- National Association of Plant Breeders since Feb. 2018.
- American Society of Plant Biologists since April 2018.

Professional Experience

- Associate Editor: Agronomy Journal (March 2018 to present).
- Peer Reviewer: Agronomy Journal (American Society of Agronomy); PNAS, Biological Sciences, India; Physiology and Molecular Biology of Plants and Agronomy (MPDI).

Open Source Contributions

ShinyAIM: Shiny-based Application of Interactive Manhattan Plots for Longitudinal GWAS available at https://chikudaisei.shinyapps.io/shinyaim/ and GitHub for direct download https://github.com/whussain2/ShinyAIM.

Posters and Conferences

- Lata, S., Guleria, S.K., Thakur, K., Kumari, R., Rana, M., and **Hussain, W**: Introgression of *Opaque2* Gene Through Marker-Assisted Backcross Breeding in Elite Maize Inbred Lines. 13th Asian Maize Conference and Expert Consultation on Maize for Food, Feed, Nutrition and Environmental Security, Ludhiana, India October 8-10,2018. P140.
- Venegas, J.P., Graybosch, R., **Hussain, W**., Bai, G., St Amand, P., Baenziger, P.S., Blecha, S: High-Density Linkage Map Construction and Mapping of Mutant Low Phytate QTLs in Winter Wheat (*Triticum Aestivum L.*) Using Genotyping-By-Sequencing (GBS). ASA, CSSA and SSSA Tampa, Florida, Oct. 22-25, 2017.
- Rana, M., Verma, P., **Hussain,W**., Kaldate, R., Shikha, D., Kaachra, A., Chahota, R.K., Bhatia,S., and Sharma, T.R: Molecular Mapping of QTLs for Drought Tolerance and Yield Traits in Lentil. InterDrought-V, Hyderabad International Convention Center (HICC), At Hyderabad India, 21-25 Feb. 2017.
- Belamkar, V., Guttieri, M.J., El-Basyoni, I., **Hussain, W**., Poland, J., Jarquín, D., Lorenz, A.J., Baenziger, P.B:Translating Genomic Research into Cultivar Development in the Nebraska Wheat Program. Plant and Animal Genome Conference XXIV, San Diego, CA; 01/2017.
- Sallam, A., **Hussain, W**., Belmaker, V., and Baenziger, P.S: QTL Mapping for Traits Associated with Drought Tolerance and Combined Drought and Heat Tolerance in Seedling Winter Wheat. Plant and Animal Genome Conference, San Diego, CA; 01/2017.
- **Hussain, W**.,Stephen, P.B., Belamkar, V., Guttieri, M.J., Easterly, A., Venegas, J.P., Guedira, G.B., Poland, J: Development of High Density Linkage Map and Genome-Wide QTL Mapping for Grain Yield in Wheat Across Multiple Rainfed Environments. ASA, CSSA and SSSA Minneapolis, Nov. 6-9, 2106.

- Sallam, A., **Hussain, W**., Belmaker, V., and Baenziger, P.S: Molecular Genetic Dissection to Improve Seedling Drought Tolerance in Winter Wheat Using QTL Mapping. At: Nebraska City, USA, Conference: Plant Science Retreat-october 2016.
- Kariyawasam, G., **Hussain, W**., Easterly, A., Guttieri, M.J., Belamkar, V., Venegas, J.P., Baenziger, P.B., Poland, J., Faris, J., Xu, S., Rasmussen, J., and Liu, Z: QTL Mapping of Resistance to Tan Spot in a Winter Recombinant Inbred Line Population Derived from Cross between Harry and Wesley. Conference: American Phytopathological Society Annual Meeting-2016, At Tampa, Florida.
- **Hussain, W**., Baenziger, P.B., Belamkar, V., Guttieri, M.J., Easterly, A., Venegas, J.P., Guedira, G.B., Poland, J: SNP Discovery in Wheat RIL Population Using Genotyping-by-Sequencing and Genome-Wide QTL Mapping for Plant Height. Conference: 5th International Conference on Quantitative Genetics, At Madison, Wisconsin, USA.
- Belamkar, V., Guttieri, M.J., El-Basyoni, I., **Hussain, W**., Poland, J., Jarquín, D., Lorenz, A.J., Baenziger, P.B: Genomic Selection Shows Promise for Improving Winter Wheat: Insights from the University of Nebraska-Lincoln Wheat Breeding Program. Conference: 5th International Conference on Quantitative Genetics, At Madison, Wisconsin, USA.
- Belamkar, V., Guttieri, M.J., El-Basyoni, I., **Hussain, W**., Poland, J., Jarquín, D., Lorenz, A.J., Baenziger, P.B: Integration of Genomic Selection in the Nebraska Wheat Breeding Program. Plant and Animal Genome Conference XXIV, San Diego, CA; 01/2016.
- **Hussain, W**., Stephen, P.B, Guttieri, M.J., Easterly, A., Venegas, J.P., Guedira, G.B., Poland, J: Mapping QTLs for Plant Height Variation in RIL Population Derived from Cross Between Harry X Wesley Semi-Dwarf Wheat Lines. ASA, CSSA and SSSA Minneapolis, Nov. 15-18, 2105.

Skills

Quantitative Skills

- Genotyping-by-sequencing data analysis and SNP calling
- Trained to perfom RNA-seq data anlysis
- Quantitative Genetics
    - QTL Mapping: R/qtl, R/ASMap, IciMapping etc.
    - Genome-wide Association Mapping: Plink, TASSEL, BGLR, rrBLUP, GAPIT, FarmCPU etc.
    - Genomic Selections: BGLR, rrBLUP etc.
- 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
- Big data analysis, high-throughput and cloud computing, linux shell and git.
- Latex and R Markdown
- Perl

Teaching Experience

Teaching Experience 1

- This lecture was one of the lectures in course ASCI 944/STAT 844 Quantitative Methods for Genomics of Complex Traits taught by Dr. Gota Morota. In this lecture I talk about basic concepts in GWAS, how to correct for population stratification, and statistical models to run GWAS and also showed practical demonstration how to perform GWAS in R-software.

Teaching Experience 2

- This lecture was delivered in Rclub hosted by students in the Agronomy and Horticulture department, University of Nebraska, Lincoln. In this lecture I discussed about data visualizations in ggplot, interactive visualizations using plotly, multiple plots in same panel, correlations and correlation heat maps.

References

Dr. P. Stephen Baenziger

Professor and Nebraska Wheat Growers Presidential Chair
Department of Agronomy and Horticulture
362D Plant Science Building
1875 N. 38th Street
University of Nebraska
Lincoln, NE 68583-0915

"I work for Nebraska"
Office: 402-472-1538
Fax: 402-472-7904
Email: pbaenziger1@unl.edu
http://agronomy.unl.edu/baenziger
http://agronomy.unl.edu/grains
Twitter: @Huskerwheat

Dr. Tilak Raj Sharma
Joint Director (Research) & Director (Acting)
Indian Institute of Agricultural Biotechnology, Ranchi
Phone: +919418057601
Email: trsharma88@gmail.com; sharmat88@yahoo.com

Dr. Vikas Belamkar
Research Assistant Professor
University of Nebraska, Lincoln, USA
Department of Agronomy & Horticulture
PLSH 386
Lincoln NE 68583-0915
Phone: 806-4457932
Email: vikas.belamkar@unl.edu

Dr. Gota Morota
Assistant Professor, Quantitative Genetics
368 Litton Reaves Hall
175 West Campus Drive
Virginia Tech
Blacksburg, Virginia 24061
Phone: 540-231-4732
Email: morota@vt.edu
Website: www.morotalab.org

Dr. Diego Jarquin
Research Assistant Professor
University of Nebraska, Lincoln, USA
Department of Agronomy & Horticulture
KEIM 321
Lincoln NE 68583-0915
Phone: 402-472-5361
Email: jhernandezjarquin2@unl.edu