Waseem Hussain

Postdoctoral Research Associate
Department of Animal Sciences
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Research Interests

Interested in incorporating quantitative genetics, statistical genomics, and bioinformatics to bridge the gap between phenotype and genotype. The primary research areas I want to focus is a characterization of alleles and diversity analysis using advanced genomic technologies, mapping (via linkage and or association) QTLs with emphasis on biotic and abiotic stresses, genomic selection/predictions in cultivar and hybrid development, gene cloning and characterization of candidate genes and marker-assisted breeding.

Education

University of Nebraska Lincoln USA

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

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

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

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

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

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

B.S. in Agriculture,June 2009

Professional Positions

Maharashtra Hybrid Seed Company (MAHYCO), India

Research Assoc. Scientist-II (Wheat Breeder); July 2017- Dec. 2017

Research Experience

Postdoctoral Research Associate

University of Nebraska, Lincoln-USA
Department of Animal Sciences
March 2018 to present

The goal is to conduct research on statistical and computational methods used in development and implementation of quantitative genetic methodologies to study the genetic and physiological architecture of high night temperature stress in wheat.

Responsibilities are:

- Quantitative genetic analysis of longitudinal high-throughput image data of night temperature stress in wheat
- Perform genome-wide analysis and genomic predictions of high-throughput image data combined with high dimensional genomic, transcriptomic and metabolomics data of
- Software development in R, Julia, and C++

Research Assoc. Scientist-II (Wheat Breeder)

MAHYCO, Seeds India
May 2017 to Dec. 2017

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

Graduate Research Fellow (ICAR International Fellow)

University of Nebraska, Lincoln-USA
Jan. 2014-May 2017

- Focused on the development and evaluation of RIL mapping population derived from a cross between Harry (Drought tolerant) and Wesley (Drought susceptible) across multiple rainfed environments in Great Plains of U.S.A.
- Identification of RILs with high adaptability and 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 across multiple environments for the last three years to evaluate the agro-morphological characteristics of RIL mapping population.

- Analyzed multi-environment phenotypic data in ASREML package in R and incorporating spatial corrections using mixed linear models and generate variance components and BLUP/BLUE estimates for genomic selections and QTL mapping.

Graduate Research Fellow (INSPIRE Fellowship)

CSKHPKV, Palampur India.
Dec. 2011 – Dec. 2013

- 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

Sher-I-Kashmir Univ. of Agric. Sci. and Technol.-Kashmir, India.
Aug. 2009 – Nov. 2011

- Identification of restorer lines for newly developed temperate CMS lines.
- Heterosis and combining ability studies in rice under temperate conditions.

Fellowships and Awards

- OSG User School Award 2018.
- Travel Grant Award Kansas State Plant Breeding Symposium-2017.
- USDA ICQG 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.

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.

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; PNAS, Biological Sciences, India; Physiology and Molecular Biology of Plants.

Training and Short Courses

- 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.
- UNL Plant Phenomics Symposium. Cather Dining Complex, University of Nebraska-Lincoln. April 2, 2018.
- Short term bioinformatics training (RNA-seq and DNA-seq). ArrayGen Technologies, India, Pune .
- 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.
- The Use of R/QTL, MAGIC QTL Populations and Genomic Selection in Plant Breeding. A&M University, College Station, Texas. Sept. 2015.
- Write Wining Grant Proposals, University of Nebraska, Lincoln, March 18, 2016.

Open Source Contributions and Software Development

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.

Refereed Journal Articles

1. **Waseem Hussain**, P. Stephen. Baenziger, Vikas Belamkar, Mary J. Guttieri, Jesse Poland (2018). Mean-Variance QTL mapping for Plant Height in wheat revealed novel QTLs and interactions. Under preparation for The *Plant Journal*.

2. **Waseem Hussain**, P. Stephen. Baenziger, Vikas Belamkar, Mary J. Guttieri, Ahmed Sallam, Jesse Poland (2018). Registration of Bread Wheat Recombinant Inbred Line Mapping Population (RIL) Derived from Cross Between Harry and Wesley. *Journal of Plant Registrations* (accepted).

3. **Waseem Hussain**, P. Stephen. Baenziger, Vikas Belamkar, Mary J. Guttieri, Jorge P. Venegas, Amanda Easterly1, Jesse Poland (2017). Genotyping-by-sequencing derived high-density linkage map and its application to QTL mapping of flag leaf traits in bread wheat. *Scientific Reports* 10.1038/s41598-017-16006-z.

4. Vikas Belamkar, Mary J. Guttieri, **Waseem Hussain**, Diego Jarquin, Ibrahim El-basyoni, Jesse Poland, Aaron J. Lorenz, P. Stephen Baenziger (2017). Genomic Selection in Preliminary Yield Trials in a Winter Wheat Breeding Program. *G3: Genes, Genomes, Genetics*. *https://doi.org/10.1534/g3.118.200415*.

5. Jorge Venegas, Bob A. Graybosch, **Waseem Hussain**, Guihua Bai, Paul St. Amand, Nathan Palmer, Sarah Blecha, P. Stephen Baenziger (2018). Genotyping-by-sequencing (GBS) identifies QTLs associated with a low phytate mutant in winter wheat (*Triticum aestivum* L.). Frontiers of Plant Sciences (submitted).

6. Geng Bai, Yufeng Ge, **Waseem Hussain**, P. Stephen Baenziger, George Graef (2016). Multi-sensor system for high throughput field phenotyping in soybean and wheat breeding. *Computers and Electronics in Agriculture*. https://doi.org/10.1016/j.compag.2016.08.021.

7. Badiyal A, Chaudhary HK, Jamwal NS, Bhat AK, and **Hussain W** (2016). Comparative assessment of different auxin analogs on haploid induction in triticale x wheat derived backcross Generations. *Agricultural Research Journal*. 10.5958/2395-146X.2016.00031.4.

8. Jamawal NS, Badiyal A, **Hussain W** and Chaudhary HK (2015). Factors influencing crossability among triticale and wheat and its subsequent effect along with hybrid necrosis on haploid induction. *Acta Agriculturae Scandinavica, Section B - Plant Soil Science* http://dx.doi.org/10.1080/09064710.2015.1095939.

9. Chaudhary L, Sood VK, **Hussain** W (2014). Genetic analysis for grain and forage yield and its component traits in genus *Avena* under North-western Himalayas. *Range Management and Agroforestry*. http://www.indianjournals.com/IJOR.

10. Sood VK, Rana I, **Hussain W** and Chaudhary HK (2014). Assessing genetic diversity of genus *Avena* from North Western- Himalayan region using molecular Markers. *Proceedings of the National Academy of Sciences, India Section B: Biological Sciences.* DOI: 10.1007/s40011-014-0427-3.

11. Badiyal A, Chaudhary HK, Jamawal NS, **Hussain W**, Mahato A and A.K. Bhatt AK (2014). Interactive Genotypic Influence of Triticale and Wheat on their Crossability and Haploid

Induction under Varied Agroclimatic Regimes. *Cereal Research Communications* 10.1556/CRC.2014.0017

12. Gulzar S. Sanghera and **Waseem Hussain** (2013). Manifestation of heterosis for yield and component traits in rice (Oryza sativa L.) under temperate environment. *An International Journal of Life Sciences.* 10.5958/j.2319-118X.1.3.020.

13. Gulzar S. Sanghera and **Waseem Hussain** (2012). Heterosis and combining ability estimates using Line x Tester analysis to develop rice hybrids for temperate conditions. *Notulae Scientia Biologicae.* http://dx.doi.org/10.15835/nsb437873.

14. **Waseem Hussain** and Gulzar S. Sanghera. (2012). Exploitation of heterosis in rice (Oryza sativa L.) using CMS system under temperate conditions. *Electronic Journal of Plant Breeding*. ISSN 0975-928X.

15. Gulzar S. Sanghera, Shabir H. Wani, **Waseem Hussain** and N.B. Singh. (2011). Engineering cold stress tolerance in crop plants. *Current Genomics*. 10.2174/138920211794520178.

16. Gulzar S. Sanghera, Shabir H. Wani, **Waseem Hussain**, Wajida Shafi, A. Haribhushan and Naorem B.Singh. (2011). The Magic of Heterosis: New tools and complexities. http://www.sciencepub.net/nature/ns0911/006_6901ns0911_42_53.pdf.

Book Chapters

1. Gulzar S. Sanghera, Shabir H. Wani, **Waseem Hussain** and N.B. Singh (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.Pp. 173-201. DOI: 10.2174/97816810817311160401

2. Chaudhary HK, Kaila V, Rather SA, Badiyal A, **Hussain W**, Jamwal NS and Mahato A. (2013). In: Pratap and J. Kumar (eds.), *Alien Gene Transfer in Crop Plants, Volume Achievements and Impacts*. Springer, pp 1-26.

3. **Hussain W**, Sanghera GS, Jamawal NS and Anila Badiyal. (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

4. Dar SH, **Hussain W** and Sanghera GS. (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.

Invited Talks

- Shiny Based Imaging GWAS Server, at University of Nebraska Lincoln, Deptt. of Statistics, 2018.
- New tools to Understand and Improve Wheat in Genomics Era, at Maharashtra Hybrid Seed Company (MAHYCO), India, 2017.
- Genotyping-by-sequencing derived high-density linkage map and its application to QTL mapping of flag leaf traits in bread wheat" at Kansas State Plant Breeding symposium, 2017.
- Development of high-density linkage map in wheat and genome-wide QTL mapping for plant height at the University of Nebraska, Lincoln Plant Breeding and Genetics Symposium, 2016.

Teaching

- Lectures on course "Quantitative methods for genomics of complex traits."

Poster Presentations and Conferences

1. 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*.

2. Maneet Rana, Priyanka Verma, Waseem Hussain, Rahul Kaldate, Divya Shikha, Anish Kaachra, Rakesh K. Chahota, Sabhyata Bhatia, and Tilak R. Sharma: *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.

3. Ahmad Sallam, Waseem Hussain, Vikas Belmaker and P.Stephen Baenziger: *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 (WWW).

4. Waseem Hussain, P. Stephen Baenziger, Vikas Belamkar, Mary J. Guttieri, Amanda Easterly, Jorge P.Venegas, Gina Brown Guedira, Jesse Poland: *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.

5. Ahmad Sallam, Waseem Hussain, Vikas Belmaker and P.Stephen Baenziger *Molecular Genetic Dissection to Improve Seedling Drought Tolerance inn Winter Wheat Using QTL Mapping*. At: Nebraska City, USA, Conference: Plant Science Retreat-october 2016.

6. G. Kariyawasam, **W. Hussain**, A. Easterly, M. Guttieri, V. Belamkar, J. Venegas, S. Baenziger, J. Poland, J. Faris, S. Xu, J. Rasmussen and Z. Liu: *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

7. **Waseem Hussain**, P. Stephen Baenziger, Vikas Belamkar, Mary J. Guttieri, Amanda Easterly, Jorge P.Venegas, Gina Brown Guedira, Jesse Poland: *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. DOI: 10.13140/RG.2.1.1949.6567

8. Vikas Belamkar, Mary J Guttieri, Ibrahim El-Basyoni, **Waseem Hussain**, Jesse Poland, Diego Jarquín, Aaron J Lorenz, P Stephen Baenziger: *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. DOI: 10.13140/RG.2.1.5193.6887

9. Vikas Belamkar, Mary J Guttieri, Ibrahim El-Basyoni, **Waseem Hussain**, Jesse Poland, Diego Jarquín, Aaron J Lorenz, P Stephen Baenziger: *Integration of Genomic Selection in the Nebraska Wheat Breeding Program*. Plant and Animal Genome Conference XXIV,, San Diego, CA; 01/2016

10. **Waseem Hussain**, P. Stephen Baenziger, Mary J. Guttieri, Amanda Easterly, Jorge P.Venegas, Gina Brown Guedira, Jesse Poland: *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.

11. **Hussain W** and Sanghera GS. *Genetic Analysis for Various Agro-Morphological Traits in Rice (Oryza Sativa L.) Using CMS System Under Temperate Conditions*. Proc. Int. Conf Sustainable Agriculture for Food and Livelihood Security. Nov. 27-29, 2012, Ludhiana, India, crop improvement: vol. 4: pp 455-456.

12. Sood VK and **Hussain W**. *Combining Ability Analysis for Various Forage Traits through Polycross Analysis in Setaria (Setaria Anceps L.) Grass*. Proc. Int. Conf Sustainable Agriculture for Food and Livelihood Security. Nov. 27-29, 2012, Ludhiana, India, crop improvement: vol. 4: pp 453-454.

13. **Hussain W** and Mir SD. *Hybrid Rice Research Development in Kashmir: Where Are We Now*? In: Mountain Agriculture in Transition- Challenges and Way- Forward held at SKUAST-K, sep. 8-10, 2011.

14. Sanghera GS, Rather AG, Hussain AM, Kashyap SC**, Hussain W**, Dar Z and Sofi NR. *Prospects of Three- Line Hybrid Rice (Oryza Sativa L.) Under Temperate Kashmir Conditions*. In: Mountain Agriculture in Transition- Challenges and Way- Forward held at SKUAST-K, *Sep*. 8-10, 2011.

15. **Hussain W**, Chaudhary HK, Rather SA and Kaila V. *Breeding for Rice (Oryza sativa L.) Cold Tolerance in Genomics era*. In: Indian Agriculture: Present Situation, Challenges, Remedies and Road Map, held at CSKHPKV, Palampur (H.P) on Aug 04-05, 2012.

Software proficiencies

- Trained and proficiency in R-software, SAS Software, TASSEL, STRUCTURE, Unix and Ubuntu operating system, Perl programming, etc.

References

1. Dr. P. Stephen Baenziger

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