

Personal**Anuradha Singh | Ph.D.**

Research Associate

Department of Plant, Soil, and Microbial Science

Michigan State University, 1066 Bogue St,

East Lansing, MI, 48824, USA

Contact No: 517-980-6164

Email ID: singha57@msu.eduannusingh1206@gmail.com

Twitter ID: @annusingh1206

ORCID ID: 0000-0001-9714-9095



- **Current position: July 2021-present:** I am presently employed as a research associate in the lab of Dr. Addie Thompson at Michigan State University, USA.
- **Current research interests:** My current research focuses on genomics and phenomics analyses of multiple agronomic and functional traits associated with biomass and climate resilience in sorghum. The goal is to leverage natural genetic variations present in a sorghum association panel to resolve complex trait variations at both the genomic and phenotypic levels. I employ both manual and high-throughput phenotyping techniques, including physiological phenotyping, hyperspectral scanning, and multispectral unmanned aerial vehicle imaging, to phenotype sorghum plants at various growth stages across natural environmental conditions. Subsequently, advanced statistics-based genetics, genomics, and breeding pipelines are used to identify underlying genetic regulators and novel resilience alleles for the development of climate-smart sorghum varieties capable of withstanding environmental stresses. This research is crucial for predicting plant responses to specific environmental conditions, ensuring food security, and enhancing resilience in the face of climate change and evolving environmental challenges.
- **Academic History**
 - 1) **2010-2016** **Doctor of Philosophy (Ph.D.)**
University: Guru Jambheshwar University of Science and Technology (GJUS&T), Haryana jointly with National Agri-Food Biotechnology Institute (NABI), Mohali, India.
Thesis title: Expression analysis of starch biosynthesis pathway genes and their effects on starch quality in wheat.
 - 2) **2008-2010** **Master of Science in Biotechnology (M.Sc.)**
University: Pondicherry Central University (PCU), India.
Thesis title: Characterization of amylolytic bacterium and its enzyme.
 - 3) **2005-2008** **Bachelor of Science (B.Sc.) with Botany honors**
University: Banaras Hindu University (BHU), India.

- **Area of Interest**

- Quantitative genetics**

- Manual and high-throughput phenotyping
 - Big data analysis and statistics

- Crop ecophysiology**

- Photosynthesis
 - Source-sink partitioning
 - Transcriptomics

- Plant-aphid interactions**

- Chemical ecology
 - Metabolomics

- **Research Grants/Fellowships**

- 1) 2018-2020 Kreitman Postdoctoral Fellowship; 147,096 (~42,000 USD)
- 2) 2016-2018 SERB-National postdoctoral fellow; 19, 20000 RS (~23,000 USD)
- 3) 2010-2015 Junior/Senior Research Fellowship; 1,860,000 Rs (~22,000 USD)

- **Past employment**

- 1) **2018-July 2021:** I worked as postdoctoral fellow at the Ben Gurion University of Negev, Israel in the lab of Dr. Vered Tzin. During this period, my research focused on genome-wide association mapping of insect resistance mechanisms in wild emmer wheat.
- 2) **2016-2018:** I held the position of National postdoctoral fellow at the National Institute of Plant Genome Research, India. My research during this tenure involved conducting comparative transcriptomic and physiological analyses of cultivated and wild rice to decipher the genetic basis of source-sink relationship during crop growth.
- 3) **May-June 2009:** I served as an undergraduate trainee at the National Botanical Research Institute, India. During this period, my work focused on diurnal changes in expression on genes related to sugar metabolism and calvin cycle under control and drought stress conditions in cotton leaves.

- **Publications**

Google scholar link: <https://scholar.google.com/citations?user=zOaKpmYAAAAJ&hl=en>

- First author papers**

- 1) **Singh A[#]**, Mathan J[#], Dwivedi A, Rani R, Ranjan A (2024) Gene regulatory networks and key genes determining rice source and sink strength unveiled by transcriptomic and metabolic comparisons of cultivated and wild rice. *bioRxiv*;
- 2) **Singh A**, Newton L, Schnable JC, Thompson AM (2024) Unveiling shared genetic regulators for plant architectural and biomass yield traits in sorghum. *bioRxiv*; doi: <https://doi.org/10.1101/2024.03.13.584802>
- 3) Mathan J[#], **Singh A[#]**, Jathar V[#], Ranjan A (2021) High photosynthesis rate in two wild rice species is driven by leaf anatomy mediating high Rubisco activity and electron transport rate. *Journal of Experimental Botany*, erab313; **#Equal contribution**
- 4) **Singh A**, Dilkes B, Sela H and Tzin V (2021) The Effectiveness of Physical and Chemical Defense Responses of Wild Emmer Wheat Against Aphids Depends on Leaf Position and Genotype. *Frontiers in Plant Science*, 12: 667820.

- 5) Mishra A[#], **Singh A[#]**, Sharma M, Kumar P, Roy J (2016) Development of EMS treated mutation lines for dynamic range of amylose variation in bread wheat (*Triticum aestivum*). *BMC Plant Biology*, 16:217; [#]**Equal contribution**.
- 6) **Singh A**, Kumar P, Sharma M, Tuli R, Dhaliwal HS, Chaudhury A, Pal D, Roy J (2015) Expression patterns of genes involved in starch biosynthesis during seed development in bread wheat (*Triticum aestivum*). *Molecular Breeding*, 35: 184.
- 7) **Singh A**, Mantri S, Sharma M, Chaudhury A, Tuli R, Roy J (2014) Genome-wide transcriptome study in wheat identified candidate genes related to processing quality, majority of them showing interaction (quality x development) and having temporal and spatial distributions. *BMC Genomics*, 15: 29.

- **Co-authors papers**

- 1) Mathan J, **Singh A**, Ranjan A (2021) Sucrose transport and metabolism control carbon partitioning between stem and grain in rice. *Journal of Experimental Botany*, 28;72, 4355-4372.
- 2) Mathan J, **Singh A**, Ranjan A (2020) Sucrose transport in response to drought and salt stress involves ABA-mediated induction of OsSWEET13 and OsSWEET15 in rice. *Physiologia Plantarum*, 171, 620-637.
- 3) Batyrshina ZS, Yaakov B, Shavit R, **Singh A**, Tzin V (2020) Comparative transcriptome and metabolic analysis of wild and domesticated wheat genotypes reveals differences in chemical and physical defense mechanisms against aphids. *BMC Plant Biology*, 20:19.
- 4) Gyan NM, Yaakov B, Weinblum N, **Singh A**, Cna'ani A, Ben-Zeev S, Saranga Y, Tzin V (2020) Variation between three *Eragrostis tef* accessions in defense responses to *Rhopalosiphum padi* aphid infestation. *Frontiers in Plant Science*, 11, 598483.
- 5) Sharma M, Sandhir R, **Singh A**, Kumar P, Mishra A, Jachak S, Singh SP, Singh J, Roy J (2016) Comparative analysis of phenolic compound characterization and their biosynthesis genes between two diverse bread wheat (*Triticum aestivum*) varieties differing for chapatti (unleavened flat bread) quality. *Frontiers in Plant Science*, 7: 1870
- 6) Aggarwal S, Shukla V, Bhati KK, Kaur M, Sharma S, **Singh A**, Mantri S, Pandey AK (2015) Hormonal Regulation and Expression Profiles of Wheat Genes Involved during Phytic Acid Biosynthesis Pathway. *MDPI Plants* 4: 298-319.

- **Review paper**

- 1) Yadav A, Mathan J, Dubey AK, **Singh A*** (2024) The emerging role of non-coding RNAs (ncRNAs) in plant growth, development, and stress response signaling. *non-coding RNA*, MDPI, 10, 13; <https://doi.org/10.3390/ncrna10010013>

- **Book chapters**

- 1) **Singh A***, Yadav A (2024) Use of wheat wild relatives to improve end-use quality in a continuously changing climate scenario. In *Wheat Wild Relatives: Developing Abiotic Stress Tolerance under Climate Change* [Editors: Khan MK, Pandey A, Hamurcu M, Gezgin S], Elsevier.
- 2) Yadav A, Mathan J, Bhati KK, **Singh A*** (2022) Role of Nitric oxide in abiotic stress tolerance in plants. In *Nitric Oxide in Plant Biology: An Ancient Molecule with Emerging Roles* (edited by Vijay Pratap Singh), Elsevier.

- 3) **Singh A***, Yadav A, Roy JK, Bhati KK* (2021) Role of genome engineering for the development of resistant starch-rich, allergen-free and processing quality improved cereal crops. In Genome Engineering for Crop Improvement. Editor: Dr. Santosh K Upadhyay, Wiley, DOI:10.1002/9781119672425
- 4) Bhati KK*, Riyazuddin R, Pathak A, **Singh A*** (2021) The survey of genetic engineering approaches for oil/fatty acid content improvement in oilseed crops. In Genome Engineering for Crop Improvement. Editor: Dr. Santosh K Upadhyay, Wiley, DOI:10.1002/9781119672425
- 5) **Singh A**, Mathan J, Yadav A, Goyal AK, Chaudhury A (2021) Molecular and Transcriptional Regulation of Seed Development in Cereals: Present Status and Future Prospects. Cereal Grains, IntechOpen.

- **Submission**

- 1) Roy JK, **Singh A**, Mantri S, Tuli R (2014) Wheat microarray data of 36 Affymetrix chips submitted in NCBI's Gene Expression Omnibus (GEO) with accession number GSE53606.

- **Teaching & Mentee-Mentorship**

- 1) Teaching assistant for graduate course CSS 844: Frontiers in Computational & Plant Sciences (Spring semester 2022) at MSU, MI, USA.
- 2) Participating as a Mentee in the Maize Genetics Mentoring Program 2022 with Dr. Pat Morgan.
- 3) Supervised over 15 undergraduate dissertation students.

Year	Name	Thesis title
2024	Jenna Wood	Genome-wide identification of genes underlying the variation in tannin content in a sorghum association panel.
2022	Emily N. Mikulski	Genetic variation for photosynthetic efficiency in Sorghum.
2017	Antara Malik	Molecular cloning of sucrose transporters and expression analysis of source-to-sink biosynthesis genes in rice (<i>Oryza sativa</i> L.).
2014	Sujata	Genotyping of wheat lines for storage protein genes.
2013	Harleen Kaur	Molecular characterization of ADP-glucose pyro phosphorylase gene and biochemical analysis of wheat starch and associated proteins.
2013	Ankita Mishra	Molecular characterization and biochemical analyses of starch branching enzyme and isoforms and starch associated proteins in wheat.
2012	Aarti Katoch	Molecular and expression analysis of starch degrading enzymes in wheat.
2012	Iram Preet Kaur	Cloning and sequencing of genes involved in starch biosynthesis pathway and distribution of starch granules in developing wheat seeds.
2011	Manoj Kumar Singh	Identification of putative single nucleotide polymorphism in HMW-Gs subunit genes of wheat.
2011	Pooja Walia	Screening of wheat proteins in diverse wheat lines.
2011	Monika Chauhan	Screening of SSR markers in selected wheat lines.
2011	Loveleen Goraya	Molecular characterization of gliadins in wheats.
2011	Balpreet Kaur	Molecular characterization of glutelin in wheats.
2011	Rajwinder Kaur	Screening of polymorphic markers in wheat lines.
2011	Subodh Verma	Screening and characterization of iron storage, ferritin genes in various wheats.

2011	Gauri Gupta	Screening, identification and cloning of a novel iron transporter in wheat varieties.
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- **Research in news:**

- 1) <https://www.timesofisrael.com/israeli-study-pest-defenses-in-wild-wheat-can-help-save-cultivated-species/>
- 2) <https://www.jewishpress.com/news/science-and-tech/israeli-scientists-learn-how-cultivated-wheat-can-protect-itself-from-insects/2022/08/08/>
- 3) <https://www.jpost.com/science/article-714185>
- 4) <https://phys.org/news/2022-08-figuring-wild-wheat-insects.html>
- 5) <https://www.eurekalert.org/news-releases/961158>

- **Outreach activity**

- 1) ASPB Ambassador badge to serve plant science community (2023-2024).
- 2) Recommending noteworthy maize primary literature monthly from April 2022: MaizeGDB.
- 3) Mentor 7-9th grade students through Michigan Youth Institute, World Food Prize Foundation, 2023.
- 4) Mentor middle and high school students through Ecotek lab program, 2023.
- 5) Judged for Agriculture and Animal Science section at the University Undergraduate Research and Arts Forum (April 2024), MSU, USA.
- 6) Judged at the Plant Science Graduate Student Research Symposium (April 2022), at PSM, MSU, USA.

- **Scientific Activity/Service**

- 1) July 2022: Review Editor in Frontier in Plant Science (Plant Pathogen Interaction).
- 2) Manuscript reviewer: >40 manuscripts for 5 journals (MDPI agronomy, Bio-protocol, Frontier in Plant Science, Springer Plants, BMC Biotechnology, BMC plant Methods).

- **Awards and Honours**

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| 2023 | ASPB travel award to attend Plant Biology meeting, 2023. |
| 2022 | Disciplinary Breadth Award, Maize Genetic Meeting, 2022. |
| 2013 | National Eligibility Test for Lectureship, ASRB India. |
| 2010 | National Eligibility Test for Lectureship, CSIR India. |
| 2009 | GATE in Life Science, IIT Roorkee, India. |
| 2008 | Combined Entrance Exam for Biotechnology and scholarship, India. |
| 2008 | Postgraduate Entrance Test for M.Sc. Botany, BHU India. |
| 2005 | Undergraduate Entrance Test for B.Sc. hons, BHU India. |

- **Conference Talk & Posters**

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| 2024 | Poster presentation at the 10 th annual symposium of the Plant Biotechnology for Health and Sustainability, MSU, USA. |
| 2024 | Poster presentation at the 1 st International Plant Resilience Summit, MSU, USA. |
| 2024 | Poster presentation at the 8th annual international scholar showcase, MSU, USA. |

- 2024 Fast-forward talk at North American Plant Phenotyping Network, Purdue, USA.
- 2023 Poster presentation at the ASPB-Plant Biology 2023, Georgia, USA.
- 2023 Digital presentation at the 7th annual international scholar showcase, MSU, USA.
- 2023 Short talk at the 2023 Maize Genetic Meeting, Saint Louis, USA.
- 2022 Invited talk, NABI, Mohali, India.
- 2022 Maize Genetic Meeting, Saint Louis, USA.
- 2021 Plantae webinar: Specialized Metabolites Part 2 (Metabolites and defense).
- 2020 Poster presentation at the Plant Biology 2020, Worldwide Summit (Virtual).
- 2020 Digital presentation at the 9th ILANIT/FISEB Conference, Eilat, Israel.
- 2019 Poster presentation at the 30th Evenari Symposium, BGU, Israel.
- 2019 Poster presentation at the KEYSTONE SYMPOSIA, Hannover, Germany.
- 2019 Poster presentation at the Israeli Society of Plant Sciences, BGU, Israel.
- 2017 Bioinformatics workshop on Genomics, IIT Delhi.
- 2015 Societal Fellowship Scheme of DST for Women Empowerment, India.
- 2014 Poster presentation at the 29th Carbohydrate conference CARBO-XXIX, Mohali, India.
- 2014 Poster presentation at the Science of Omics for Agricultural Productivity: Future Perspectives, India

- **Professional Organization Membership**

- 1) Maize Genetics Cooperation
- 2) American Society of Plant Biologists
- 3) Society for Experimental Biology
- 4) International Wheat Genome Sequencing Consortium