SIMRANDEEP KAUR

(Graduate Research Assistant, Auburn University, AL, USA)

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RESEARCH INTERESTS

My research interests include but are not limited to:

- Studying the Genetics and Genomics of Host-Pathogen interactions.
  - Elucidating virulence mechanisms using Molecular Biology, Genetic, Proteomic, and Genomic approaches.
  - Identifying and characterizing genes and signal transduction pathways involved in plant-microbe interactions.
  - Identifying and Isolating pathogen's effector and host's resistance proteins using Molecular and Biochemical studies, further characterizing Resistance Protein-mediated Signaling, and developing genetic markers for them.
  - Studying immune response mechanism of Systemic Acquired Resistance and Induced Systemic Resistance.
- Work on genetically improving crops for disease resistance.
  - Using a combination of conventional and Molecular Breeding, Genetic and Genomic tools (CRISPR-Cas9).

EDUCATION

MS Plant Sciences – Plant Pathology (Aug 2022-July 2024)
Auburn University, Alabama, USA | Overall GPA: 4.0/4.0

B.Sc. Agriculture (Hons.). (Aug 2018-July 2022)
Punjab Agricultural University (PAU), India | Overall OCPA: 8.44/10

PUBLICATIONS AND CONFERENCES

- Kaur, S., Adhikari, A., Welsh, B.W., Gosse H., Lawrence, K., and Park, S.W. (2023). Root hair growth fostered by a 12-oxo-phytodienoic acid signal heightens plant resistance against plant parasitic nematodes. Planta. *(Submitted for peer review)*
- Welsh, B. W., Kaur, S., and Park, S. W. (2023). Exploiting Genetic Traits of Plant Defense Mechanisms Against Phytoparasitic Nematodes. Auburn University Journal of Undergraduate Scholarship (Link).
- Kaur, S., Adhikari, A., and Park, S.W. (2023). A Mobile Signal Priming Induced Systemic Resistance in Plants. Cell and Molecular Biology Symposium 2023, Auburn, Alabama (Poster presentation).
- Kaur, S., Adhikari, A., and Park, S.W. (2023). 12-Oxophytodienoic Acid: A Crucial Hormone Signal Priming Induced Systemic Resistance in Plants Balancing Plant Growth and Defense. Auburn University Student Research Symposium 2023, Auburn, Alabama (Poster presentation).
- Thapa, P., Kaur, S., and Park, S.W. (2023). Investigating the molecular mechanism and genetic utility of plant growth-promoting rhizobacteria mediated induced systemic tolerance. Auburn University Student Research Symposium 2023, Auburn, Alabama (Poster presentation).
- Thapa, P., Kaur, S., and Park, S.W. (2023). Investigating the molecular mechanism and genetic utility of plant growth-promoting rhizobacteria mediated induced systemic tolerance. Cell and Molecular Biology Symposium 2023, Auburn, Alabama (Poster presentation).
- Kumar, S., Roy Chowdhury, R., Kaur, S., and Chakraborty, A. (2023). Causes and effects of marine heatwaves in the Palk Strait region between 1982 and 2021. Front. Clim. (*Submitted for peer review)*

TECHNICAL SKILLS

- **Wet Lab skills**:
  - **Molecular Biology:** PCR, RT-qPCR, qPCR, Electrophoresis (Agarose, Polyacrylamide), RNA/DNA/Protein extraction, Molecular cloning, DNA sequencing, Primer designing, Mutagenesis (Site-directed, Random mutations), Homemade chemically competent cells, Agrobacterium Plant Transformation, E. coli transformation.
  - **Biochemistry:** Recombinant protein expression and purification, Western Blotting, Bradford Assay, Enzymatic assay, protein-protein *in vitro* interaction assay, SDS gel electrophoresis.
  - **Microbial techniques:** Bacterial Leaf Infiltration Assay, Isolation and Culture of major pathogen groups, Plant parasitic nematode-Arabidopsis infection assay.
  - **Others:** Grafting, Confocal and optical microscopy, Reverse genetics.
- **Software Packages:** Microsoft Office (Word, Excel, PPT)
- **Operating Machines:** MultispeQ, Sonicator, Nanodrop Spectrophotometer, WinRhizo, PH meter, Refractometer
- **Languages:** R programming, Python
- **Experimental designs**: Randomized Complete Block Design, Latin Square Design, and Incomplete Block Designs

WORK EXPERIENCE

Graduate Research Assistant (Aug 2022-present)
Department of Entomology and Plant Pathology, Auburn University, USA
Supervisor: Dr. Sang-Wook Park

Project 1: *Identification and characterization of a long-distance, mobile signal of Induced Systemic Resistance (ISR).*

- Developed ISR assays in *Arabidopsis thaliana* using bacterial leaf infiltration assay with *Pseudomonas syringae.*
- Isolated ISR-inducible and non-inducible Plant Growth Promoting Rhizobacteria in *A. thaliana* and probe ISR

development in OPDA, JA, and SA biogenesis and/or signaling mutant using Reverse Genetics.
- Performed transcription analysis to see the hormone biosynthesis/signaling maker gene induction and hormone analysis for defense hormone presence in root, stem, and leaves.

Project 2: *Elucidating the enzymatic activity and gene expression of IST (against drought) genes- RD29A and RD29B.*

- Prepared recombinant RD29A and RD29B proteins by expressing them in E. coli BL21:PET28A expression system.
- Performed an enzymatic assay and looked at the kinetics of RD29A and RD29B proteins.
- Seen time-course expression and compensatory effect of these in various abiotic stresses and characterize them as circadian rhythm genes.

Project 3: *Characterization of defense hormones (OPDA, JA,* and *SA) in plant defense responses against plant parasitic nematodes (PPN).*

- Established a model patho-system between Arabidopsis and PPN.
- Examined PPN resistance in various hormone biosynthesis and signaling mutant Arabidopsis using infection assay.
- Analyzed Arabidopsis root morphology and found their correlation to PPN tolerance in different mutants.

Project 4: *Critical Evaluation of Insulin-like Growth Factor 2's Ability to Bind to Its Receptors Via Point Mutations*

- Performed Site-Directed Mutagenesis, Colony PCR, and Sanger Sequencing for the IGF2 gene.
- Expressed mutant IGF2 mature protein Recombinant Protein in pBAD plasmid.
- Ascertained impact of the deletion and substitution on IGF-binding protein 2 using Thermostability Assay.

Internship in Experiential Learning for Seed Production Technology (Jan 2022-June 2022)
Department of Plant Breeding and Genetics, Punjab Agricultural University (PAU), India
Supervisor: Dr. Gurvinder Singh Mavi, Dr Yadhu Suneja

Project 5: *Reducing acrylamide forming potential of wheat using natural and genome editing-induced genetic variation at TaASN2 locus.*

- Performed emasculation, pollination, and phenotypic selections of wheat crops.
- Collected samples and carried out tagging, DNA isolation, quantification, and extraction.
- Produced Male sterile line, designed sowing plan, calculated isolation requirement and planting ratio.

Undergraduate Research Assistant (Dec 2023-July 2022)
Department of Biotechnology, PAU, India | Supervisor: Dr. Yogesh Vikal
- Performed Marker-Assisted Selection and Learned various Molecular Biology techniques.

Practical Crop Production Training (May 2020-Apr 2021)
Department of Agronomy, PAU, India | Supervisor: Dr. Surjeet Singh Manhas
- Handled field operations in cultivating rice and wheat: sowing, weed, pest management, harvesting, and threshing.

Student Intern in Krishi Vigyan Kendra, Samrala, India (Nov 2021)
Department of Extension Education, PAU, India | Supervisor: Dr. Manmeet Kaur
- Conducted outreach activities with farmers and prepared farm development plans using extension techniques.

Intern in Plant Clinic (Aug 2021)
Department of Extension Education, PAU, India | Supervisor: Dr. Lopamudra Mohapatra
- Diagnosed plants attacked by agriculturally important pathogens.

AWARDS AND FELLOWSHIPS

- Graduate Research Assistantship, Auburn University, USA (August 2022-present)
- Punjab Agricultural University Merit Certificate (2022)
- Shri Bal Krishan Vaid Merit Scholarship for 1st highest grade in College of Agriculture, PAU (2022)
- Punjab Agricultural University Merit Scholarship (2021)
- Merit scholarship awarded to top rankers in PAU CET entrance exam for B.S. agriculture (2018)

VOLUNTEER AND LEADERSHIP EXPERIENCE

- **Parliamentarian of F.S. Arant Entomology and Plant Pathology Club, Auburn University:** Planning and managing departmental and outreach events. (May 2023-present)
- **National Service Scheme (NSS):** Took part in various social welfare activities under this Indian government-sponsored public service program. (Aug 2018- Aug 2020)

MEMBERSHIPS

- Member, American Society of Plant Biologists (2023)
- Member, American Phytopathological society (2023)

UNIVERSITY AND COMMUNITY SERVICE (MENTORSHIP)

- Ben Welsh (undergraduate), Applied Biotechnology Major, Auburn University
- Guided Applied Biotechnology course (APBT 4100) students to obtain hands-on experiments necessary to perform "gene cloning and transformation" for various prokaryote and eukaryote organisms.

STANDARDIZED TEST SCORES

- GRE Score: 316 | Quantitative Reasoning: 166 | Verbal Reasoning: 150 | AWA: 3.5
- TOEFL: 109 | Reading: 30 | Speaking: 27 | Listening: 26 | Writing: 26