PREM PRATAP SINGH

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SCOPUS | GOOGLE SCHOLAR | RESEARCHGATE

SUMMARY

Plant scientist with expertise in plant–pathogen interactions and multi-omics analysis. Currently investigating grapevine–virus interactions using transcriptomic and metabolomic approaches, building on foundational GRBV research. Led CDFA/USDA-funded projects on grapevine virus impacts and developed nano-encapsulated antifungal formulations. Track record of 20+ publications, grant contributions, and mentorship. Proficient in R, Python, GC-MS, LC-MS/MS, RNA-seq, and bioinformatics pipelines.

PROFESSIONAL EXPERIENCE

Postdoctoral Scholar | University of California, Davis **Sep 2023-Present**

Mentor: *The late Dr. Anita Oberholster & Dr. David E Block*

- Led a multi-year, omics-driven project funded by CDFA and USDA to dissect the metabolic and transcriptional impacts of Grapevine Red Blotch Virus (GRBV) on *Vitis vinifera* cv. Merlot berries and wine quality.
- Developed and validated RT-qPCR and digital PCR assays to quantify GRBV titers across >10 vineyard blocks, enabling spatial and seasonal tracking of infection load.
- Integrated multi-platform datasets (GC-MS, LC-MS/MS, RNA-Seq) to identify putative biomarkers linked to virus-induced changes in grape cell wall composition and metabolite profiles.
- Collaborated with interdisciplinary teams of virologists, analytical chemists, and bioinformaticians to translate mechanistic findings into practical strategies for precision viticulture and harvest decision-making.
- Presented results at national conferences (ASEV and ASPB), contributing to stakeholder outreach and industry workshops on GRBV management and quality control.

Ph.D. (Plant Pathology/Post-harvest/Food-safety) **2017-2023**
Banaras Hindu University, India

Thesis: *Assessment and amelioration of plant-based bioactive formulation against food-borne pathogens*

- Engineered a nano-encapsulated essential oil (EO) formulation using chitosan-gel matrices, which significantly inhibited *Aspergillus flavus* growth and aflatoxin B_1 production, demonstrating efficacy in postharvest food safety applications.
- Set up a multi-disciplinary R&D pipeline integrating antifungal screening, GC-MS metabolomics, SEM imaging, and gene expression analysis to uncover the mechanism of action involving oxidative stress and membrane disruption.
- Developed a green, cost-effective, and scalable chitosan-based delivery system, resulting in enhanced formulation stability and sustained release over 60 days in postharvest conditions.
- Published >10 peer-reviewed articles and presented findings at 5+ national conferences, contributing to IARI's translational postharvest biotech program.

RESEARCH AREA

- Grapevine-virus interactions and disease impacts on berry development and metabolism
- Transcriptomics and multi-omics integration in plant–pathogen systems
- Computational biology (pathway analysis, molecular docking, protein modeling)
- Plant pathology and postharvest biology
- Nanoencapsulation of plant-derived bioactive compounds
- Plant volatiles: extraction, characterization, and biological activity

TECHNICAL SKILLS

- **Plant-Pathogen Interactions:** Grapevine virus–host dynamics, transcriptomic profiling of disease responses, viral detection and quantification, metabolic pathway analysis in infected tissues
- **Analytical Techniques:** GC-MS, LC-MS/MS, RT-qPCR, digital PCR, RNA-seq, SEM imaging, spectral analysis
- **Data Science & Bioinformatics:** R (Bioconductor, DESeq2, ggplot2), Python, multi-omics integration, statistical modeling, pathway enrichment analysis, data visualization
- **Postharvest & Food Safety:** Quality evaluation, storage trials, maturity indices, microbial safety, aflatoxin analysis, controlled atmosphere systems
- **Formulation & Delivery:** Nano-encapsulation, chitosan matrices, essential oil formulations, sustained-release systems
- **Research Management:** Experimental design, grant writing, mentorship, cross-functional coordination, stakeholder communication

EDUCATION

Ph.D. (Plant Pathology/Post-harvest/Food-safety) 2017-2023
Banaras Hindu University, India
Thesis: *Assessment and amelioration of plant-based bioactive formulation against food-borne pathogens*

M. Sc. in Botany *(Gold Medalist)* 2017
Banaras Hindu University, India
Specialization: Plant Pathology and Plant Protection, Microbial genetics and Biotechnology and Conservation and Restoration Ecology

B. Sc. in Botany 2015
Banaras Hindu University, India

PUBLICATIONS

RESEARCH & REVIEW PAPERS

1. **Prem Pratap Singh**, Reddy, K., Boghozian, A. M., Oberholster, A., & Sudarshana, M. R. Grapevine Red Blotch Disease: An Emerging Threat to Global Viticulture. (*In pipeline*)
2. **Prem Pratap Singh**, Scully, H., Reddy, K., Boghozian, A. M., Medina-Plaza, C., Oberholster, A., & Sudarshana, M. R. Temporal Dynamics of Grapevine red blotch virus accumulation in Grapevine leaves is Influenced by Fruit Maturity Stages. (*In pipeline*)
3. **Prem Pratap Singh**, Singh, R., Verma, P. K. & Prakash, B. Systematic elucidation of aflatoxigenic Aspergillus flavus inhibition: Integrating EOs-based formulation with mathematical modeling and transcriptomic analysis. (*In pipeline*)
4. **Prem Pratap Singh,** Atul Kumar Jaiswal, Ritu Singh, Akshay Kumar, Vishal Gupta, Tanya Singh Raghuvanshi, Angad Sharma, and Bhanu Prakash. "Assessment of *Trachyspermum ammi* essential oil against *Aspergillus flavus*, aflatoxin B1 contamination, and post-harvest quality of

Sorghum bicolor." Food Chemistry 443 (2024): 138502.

5. **Prem Pratap Singh,** Atul Kumar Jaiswal, Tanya Singh Raghuvanshi, and Bhanu Prakash. "Insights into the antimicrobial efficacy of *Coleus aromaticus* essential oil against food-borne microbes: Biochemical and molecular simulation approaches." Food and Chemical Toxicology 182 (2023): 114111.
6. Bhanu Prakash, **Prem Pratap Singh**, Vishal Gupta, and Tanya Singh Raghuvanshi. "Essential oils as green promising alternatives to chemical preservatives for agri-food products: New insight into molecular mechanism, toxicity assessment, and safety profile." Food and Chemical Toxicology 183 (2024): 114241.
7. **Prem Pratap Singh**, Atul Kumar Jaiswal, Akshay Kumar, Vishal Gupta Bhanu Prakash (2021). Untangling the multi-regime molecular mechanism of verbenol-chemotype *Zingiber officinale* essential oil against *Aspergillus flavus* and aflatoxin B_1. Scientific Reports 1: 1-20.
8. **Prem Pratap Singh**, Vishal Gupta & Bhanu Prakash (2021). Recent advancement in functional properties and toxicity assessment of plant-derived bioactive peptides using bioinformatic approaches. Critical reviews in food science and nutrition. DOI:10.1080/10408398.2021.2002807
9. **Prem Pratap Singh**, Akshay Kumar, Bhanu Prakash (2020). Elucidation of antifungal toxicity of *Callistemon lanceolatus* essential oil encapsulated in chitosan nanogel against Aspergillus flavus using biochemical and in-silico. Food Additives & Contaminants: Part A, 37, 1520-1530. https://doi.org/10.1080/19440049.2020.1775310.
10. Vishal Gupta, **Prem Pratap Singh**, Bhanu Prakash (2023). Synthesis, characterization, and assessment of chitosan-nanomatrix enriched with antifungal formulation against biodeterioration of active ingredients of selected herbal raw materials. International Journal of Biological Macromolecules. DOI: 10.1016/j.ijbiomac.2023.123684
11. Kumar Akshay, **Prem Pratap Singh**, Manoj Kumar, and Bhanu Prakash, 2022. Nanoencapsulated plant-based antifungal formulation against the *Aspergillus flavus* and aflatoxin B_1 contamination: Unraveling the biochemical and molecular mechanism of action. International Journal of Food Microbiology, p.109681.
12. Kumar Akshay, **Prem Pratap Singh**, and Bhanu Prakash, 2022. Assessing the efficacy of chitosan nanomatrix incorporated with *Cymbopogon citratus* (DC.) Stapf essential oil against the food-borne molds and aflatoxin B_1 production in food system. Pesticide Biochemistry and Physiology, 180, p.105001.
13. Bhanu Prakash, **Prem Pratap Singh**, Akshay Kumar, and Vishal Gupta, 2022. Botanicals for Sustainable Management of Stored Food Grains: Pesticidal Efficacy, Mode of Action and Ecological Risk Assessment Using Computational Approaches. Anthropocene Science, pp.1-18.
14. Akshay Kumar, **Prem Pratap Singh**, and Bhanu Prakash (2020). “Unravelling the antifungal and anti-aflatoxin B_1 mechanism of chitosan nanocomposite incorporated with *Foeniculum vulgare* essential oil”. *Carbohydrate Polymers*, 236, 116050.

15. Akshay Kumar, Vishal Gupta, **Prem Pratap Singh**, Anupam Kujur, Bhanu Prakash (2020) Fabrication of volatile compounds loaded-chitosan biopolymer nanoparticles: Optimization, characterization and assessment against *Aspergillus flavus* and aflatoxin B1 contamination. International Journal of Biological Macromolecules, 165, 1507-1518.

16. Akshay Kumar, Anupam Kujur, **Prem Pratap Singh**, Bhanu Prakash (2019). Nanoencapsulated plant-based bioactive formulation against food-borne molds and aflatoxin B1 contamination: Preparation, characterization and stability evaluation in the food system. *Food Chemistry*. 287, 139-150.

17. Yadav Amrita, Akshay Kumar, **Prem Pratap Singh**, Bhanu Prakash (2021). Pesticidal efficacy, mode of action and safety limits profile of essential oils based nanoformulation against *Callosobruchus chinensis* and *Aspergillus flavu*s. Pesticide Biochemistry and Physiology. 175, 104813.

18. Bhanu Prakash, Anupam Kujur, Amrita Yadav, Akshay Kumar, **Prem Pratap Singh**, N. K. Dubey (2018). Nanoencapsulation: An efficient technology to boost the antimicrobial potential of plant essential oils in food system. Food Control, 89, 1–11.

19. Kumar, Manu, Sandeep Kumar Singh, **Prem Pratap Singh**, Vipin Kumar Singh, Avinash Chandra Rai, Akhileshwar Kumar Srivastava, Livleen Shukla et al. "Potential Anti-*Mycobacterium tuberculosis* Activity of Plant Secondary Metabolites: Insight with Molecular Docking Interactions." Antioxidants 10, no. 12 (2021): 1990.

20. Kumar, Ajay, Sandeep Kumar Singh, Chandra Kant, Hariom Verma, Dharmendra Kumar, **Prem Pratap Singh**, Arpan Modi et al. "Microbial biosurfactant: a new frontier for sustainable agriculture and pharmaceutical industries." Antioxidants 10, no. 9 (2021): 1472.

21. Singh, Vipin Kumar, Amit Kishore Singh, **Prem Pratap Singh**, and Ajay Kumar. "Interaction of plant growth promoting bacteria with tomato under abiotic stress: a review." Agriculture, Ecosystems & Environment 267 (2018): 129-140.

22. Singh, Amit Kishore, **Prem Pratap Singh**, Vijay Tripathi, Hariom Verma, Sandeep Kumar Singh, Akhileshwar Kumar Srivastava, and Ajay Kumar. "Distribution of cyanobacteria and their interactions with pesticides in paddy field: a comprehensive review." Journal of environmental management 224 (2018): 361-375.

21. Singh, Amit Kishore, Sandeep Kumar Singh, **Prem Pratap Singh**, Akhileshwar Kumar Srivastava, Kapil D. Pandey, Ajay Kumar, and Himanshu Yadav. "Biotechnological aspects of plants metabolites in the treatment of ulcer: A new prospective." Biotechnology Reports 18 (2018): e00256.

22. Kumar, Ajay, Monika Singh, **Prem Pratap Singh**, Sandeep Kumar Singh, Pawan Kumar Singh, and Kapil D. Pandey. "Isolation of plant growth promoting rhizobacteria and their impact on growth and curcumin content in *Curcuma longa* L." Biocatalysis and agricultural biotechnology 8 (2016): 1-7.

BOOK CHAPTERS

1. Bhanu Prakash, **Prem Pratap Singh**, Akshay Kumar, and Vishal Gupta, 2022. Food and human health: An outlook of the journey of food from hunger satisfaction to health-promoting agent. In Research and Technological Advances in Food Science (pp. 1-30). Academic Press. ISBN: 978-0-12-824369-5
2. Bhanu Prakash, Akshay Kumar, **Prem Pratap Singh**, Somenath Das, and N. K. Dubey, 2021. Prospects of plant products in the management of insect pests of food grains: current status and future perspectives. In Natural Bioactive Compounds (pp. 317-335). Academic Press. ISBN: 978-0-12-820655-3.
3. Bhanu Prakash*, **Prem Pratap Singh**, Akshay Kumar, Vishal Gupta (2020). Prospects of omics technologies and bioinformatics approaches in food science. In: Functional and Preservative Properties of Phytochemicals. Academic Press. Doi: 10.1016/B978-0-12-818593-3.00010-5.
4. **Prem Pratap Singh**, Akshay Kumar, Vishal Gupta, and Bhanu Prakash, 2021. Recent advancement in plant disease management. In Food Security and Plant Disease Management (pp. 1-18). Woodhead Publishing. ISBN: 978-0-12-821843-3.
5. Bhanu Prakash, Akshay Kumar, **Prem Pratap Singh**, L. S. Songachan (2020). Antimicrobial and antioxidant properties of phytochemicals: current status and future perspective. In: Functional and Preservative Properties of Phytochemicals. Academic Press. Doi: 10.1016/B978-0-12-818593-3.00001-4.
6. Singh MK, Singh SK, Singh AV, Verma H, **Prem Pratap Singh**, Kumar A. Phytochemicals: Intellectual property rights. In: Functional and Preservative Properties of Phytochemicals 2020 Jan 1 (pp. 363-375). Academic Press.
7. Bhanu Prakash, **Prem Pratap Singh**, Akshay Kumar, Somenath Das, and Anand Kumar Chaudhari (2019). "Microbes as a Novel Source of Secondary Metabolite Products of Industrial Significance." In: Role of Plant Growth Promoting Microorganisms in Sustainable Agriculture and Nanotechnology. Eds. Ajay Kumar, Amit Kishore Singh and Krishna Kumar Choudhary. pp. 21–37. ISBN: 978-0-12-817004-5.
8. **Prem Pratap Singh**, Anupam Kujur, Amrita Yadav, Akshay Kumar, Sandeep Kumar Singh, and Bhanu Prakash* (2019). "Mechanisms of Plant-Microbe Interactions and Its Significance for Sustainable Agriculture." In: PGPR Amelioration in Sustainable Agriculture. Eds. Amit Kishore Singh, Ajay Kumar and Pawan Kumar Singh, pp. 17–39. ISBN: 978-0-12-815879-1.

Awards

2017	GATE (conducted by IIT Roorkee)
2018	Prof. Radhey Shyam Ambasht Gold Medal (M.Sc.)
2020	"**Best Poster Presentation**", in 7th International Conference of Phytopathology in Achieving UN Sustainable Development Goals January 16-20, 2020, ICAR-IARI, New Delhi, India

TRAINING/INTERNSHIPS & CONFERENCES

Conferences

- Plant Biology 2024, American Society of Plant Biologists (ASPB) Centennial Meeting, June 22–26, 2024, Honolulu, Hawaii, USA

  Poster Presentation: Temporal Dynamics of Grapevine red blotch virus Titer in Infected Grapevines is Influenced by Fruit Maturity Stages
- International Conference on Microbiology (ICMBB2021) Organized by the Institute of Microbiology in collaboration with the American Society of Microbiology, Asian PGPR Society, and Society for Environmental Sustainability from 16-17 September 2021.
- 7th International Conference on "Phytopathology in Achieving UN Sustainable Development Goals," organized by Indian Phytopathological Society, January 16–20, 2020, ICAR-IARI, New Delhi, India

  Poster presentation: Optimization of nanoencapsulated plant based synergistic formulation in post-harvest disease management of aflatoxin
- National Seminar on Recent Advances in Fungal Diversity, Plant-Microbes Interaction and Disease Management, Centre of Advanced Study in Botany Institute of Science, Banaras Hindu University, Varanasi-221005, India, February 28-29, 2020

  Poster Presentation: Nano-encapsulated synergistic formulation of plant derived bioactive compounds in post-harvest management of aflatoxin
- Biotechnological Interventions for Societal Development, Department of Biotechnology, Motilal Nehru National Institute of Technology Allahabad, Prayagra– India, February 21-23, 2020

  Oral Presentation: Nano-encapsulated and optimised plant-based bioactive formulation against food-borne moulds and aflatoxin B_1 contamination.

Training

- Scientific Leadership & Management Skills Program. (Lawrence Berkeley National Laboratory, 2025)
- International workshop (one month) on '*Genome Informatics'*, jointly organised by Ensembl Outreach team (EMBL-EBI), UK and Decode Life from 17th June to 15th July, 2023.
- Hands-on training of Bioinformatics & data analysis workshop Organised by Redcliffe Genetics at Department of Zoology, Banaras Hindu University from- 28th July-30th July, 2022.
- International workshop on "*Basics to Advanced modules in Multiomics data analysis*" organised by Nextgenhelper, New Delhi from April 14 - 30, 2022.
- National Training on "*Bacterial Endophytes in Agriculture: Concepts to Application*" held at ICAR-NBAIM, Mau from January 07-16, 2019.

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