

CURRICULAM VITAE

Dr. Arun Kumar

Senior Scientist,
Biotechnology Division, Block-F
CSIR- Institute of Himalayan Bioresource Technology, Palampur, H.P. India
E mail IDs: arunkumar@ihbt.res.in, arunihbt@gmail.com
Contact no.: Landline: +91-1894-233339 Ext. 356
Mobile no.: +91 (941) 8830880
FAX: +91- 1894 -230433
<https://sites.google.com/view/sciroi>



Areas of Interest

Enzymology, Protein: structure and function, Host-Pathogen interactions, Functional genomics

<https://scholar.google.co.in/citations?user=EQc3kPIAAAJ&hl=en&authuser=1>

Employment

[2020- onwards]	Senior Scientist-Enzymology (Pay level-12) CSIR-Institute of Himalayan Bioresource Technology, Palampur, H.P. India
[2017- 2020]	Ramanujan Fellow School of Agricultural Biotechnology, PAU, Ludhiana, India
[2015 –2017]	Postdoctoral Research Associate Department of Horticulture, University of Wisconsin, Madison, USA.
[2013 –2015]	Postdoctoral Fellow Department of Plant Science, McGill University, Montreal, Canada.

Education

[2007 – 2013]	Ph.D. Biotechnology from Department of Biotechnology, Panjab University, Chandigarh /CSIR- Institute of Himalayan Bioresource Technology, Palampur, India.
[2002-2004]	M.Sc. Biotechnology with 9.36 CGPA (84.24%) from Thapar University, Patiala, Punjab, India.
[1998-2002]	B.Sc. (Botany, Chemistry and Zoology) with 7.42 OGPA (74.2%) from College of Basic Sciences, CSKHPKV, Palampur, H.P. India.

Academic Activities

Sem II 2017-18	Biotech 103 (2+1): Introduction to Biotechnology Biotech 305 (2+0): Introduction to Molecular Biology Biotech 499 (0+20): In House Project
Sem I 2018-19	Biotech 305 (2+0): IPR, Biosafety and Bioethics Biotech 604 (2+0): Advances in Functional Genomics and Proteomics

Sem II 2018-19	Biotech 212 (3+0): Epigenetics and Gene Regulation
Sem I 2019-20	Biotech 305 (2+0): IPR, Biosafety and Bioethics
Sem II 2019-20	Biotech 212 (3+0): Epigenetics and Gene Regulation
Sem I-II 2019-20	Biotech 499 (0+20): In House Project

Ongoing research project as PI

Sr. No.	Current project title	Funding agency	Amount	Date of start of project	Date of completion
1.	Cisgenetic engineering of rice (<i>Oryza sativa</i>) susceptible elite cultivars for enhanced disease resistance using genome editing CRISPR/Cas9 technology.	SERB, GOI	107.33 Lakhs	23 rd Oct. 2019	22 nd Oct 2022
2	Molecular cloning and characterization of <i>Xa38</i> loci conferring resistance to bacterial blight (BB) disease in rice and identification of novel and superior alleles	DBT, GOI	87.1432 Lakhs	5 th Aug.2019	4 rd Aug. 2022

Peer reviewed Publications

1. Munaiz, E.D., Martinez, S., **Kumar, A.**, Caicedo, M., Ordas, B. (2020). The Senescence (Stay-Green): an Important Trait to Exploit Crop Residuals for Bioenergy. *Energies*, **13**: 790.
2. Karre, S., **Kumar, A.**, Yogendra, K.N., Kage, U., Kushalappa, A.C., Charron, JB. (2019). *HvWRKY23* regulates flavonoid glycoside and hydroxycinnamic acid amide biosynthetic genes in barley to combat *Fusarium* head blight. *Plant Molecular Biology*, **100**: 591–605.
3. Baghel, M., Nagraja, A., Srivastav, M., Meena, N.K., Kumar, M.S, **Kumar, A.**, Sharma, R.R. (2019). Pleiotropic influences of brassinosteroids on fruit crops- a review. *Plant Growth Regulation*, **87**: 375–388.
4. **Kumar, A.**, Mosa, K., Ji, L., Kage, U., Madalageri, D., Dhokane, D., Rana, N.P. (2017). Metabolomics assisted biotechnological interventions for developing plant-based functional foods and nutraceuticals. *Critical Reviews in Food Science and Nutrition*, **58**(11):1791-1807. ***Corresponding author.**
5. **Kumar, A.**, Jansky, S., Halterman, D. (2017). Potato stem cuttings to study *Verticillium dahliae* infection for resistance breeding and -omics studies. *American Journal of Potato Research*, **94**: 270-274.
6. Karre, S., **Kumar, A.**, Dhokane, D., Kushalappa, A.C. (2016). Metabolo-transcriptome profiling of barley reveals induction of a novel chitin elicitor receptor kinase gene (*HvCERK1*) conferring resistance against *Fusarium graminearum*. *Plant Molecular Biology*, **93**: 247-267.
7. **Kumar, A.**, Sharma, M., Bhardwaj, P.K., Singh, D., Kumar, S. (2016). Copper, zinc superoxide dismutase from *Caragana jubata*: a thermostable enzyme that functions under a broad pH and temperature window. *Process Biochemistry*, **51**: 1434-1444.

8. **Kumar, A.**, Yogendra, K.N., Karre, S., Kushalappa, A.C., Dion, Y., Choo, T.M. (2016). WAX INDUCER1 (HvWIN1) transcription factor regulates free fatty acid biosynthetic genes to reinforce cuticle to resist Fusarium head blight in barley spikelets. *Journal of Experimental Botany*, **67**: 4127-39.
9. Yogendra, K.N., **Kumar, A.**, Sarkar, K., Li, Y., Pushpa, D., Mosa, K., Duggavathi, R., Kushalappa, A.C. (2015). Transcription factor *StWRKY1* regulates phenylpropanoid metabolites in potato to resist late blight. *Journal of Experimental Botany*, **66**: 7377-7389.
10. **Kumar, A.**, Karre, S., Dhokane, D., Kage, U., Hukkeri, S., Kushalappa, A.C. (2015). Real-time quantitative PCR based method for the quantification of fungal biomass to discriminate quantitative resistance in barley and wheat to fusarium head blight. *Journal of Cereal Science* **64**: 16-22.
11. Kage, U., **Kumar, A.**, Dhokane, D., Karre, S., Kushalappa, A.C. (2015). Functional molecular markers in crop improvement. *Critical Reviews in Biotechnology*, **36**: 917-930.
12. **Kumar, A.**, Randhawa, V., Acharya, V., Singh, K., and Kumar, S. (2015). Amino acids flanking the central core of Cu,Zn superoxide dismutase are important in imparting activity after autoclaving. *Journal of Biomolecular Structure & Dynamics*, **34**: 475-485.
13. **Kumar, A.**, Kaachra, A., Bhardwaj, S., Kumar, S. (2014). Copper, zinc superoxide dismutase of *Curcuma aromatica* is a kinetically stable protein. *Process Biochemistry* **49**: 1288-1296.
14. **Kumar, A***, Kage, U., Mosa, K., Dhokane, D. (2014). Metabolomics: a novel tool to bridge phenome to genome under changing climate to ensure food security. *Medicinal and Aromatic Plants* **3**: e154. DOI: 10.4172/2167-0412.1000e154. (**Editorial; *Corresponding author**).
15. **Kumar, A.**, Dutt. S., Bagler, G., Ahuja, P.S., and Kumar, S. (2012). Engineering a thermostable superoxide dismutase functional at sub-zero to >50 °C, which also tolerates autoclaving. *Scientific Reports*, **2**: 387; DOI, 10.1038/srep00387.
16. Bafana, A., Dutt. S., **Kumar, A.**, Kumar, S., and Ahuja, P.S. (2011). The basic and applied aspects of superoxide dismutase. *Journal of Molecular Catalysis B: Enzymatic* **68**: 129-138.
17. Ghawana, S., Paul, A., Kumar, H., **Kumar, A.**, Singh, H., Bhardwaj, P.K., Rani, A., Singh, K., Raizada, J., Singh, R.S., Ahuja, P.S., and Kumar, S. (2011). An RNA isolation system free of Guanidinium salts for isolation of RNA from plant tissues rich in secondary metabolites. *BMC Research Notes* **4**:85.
18. Ganguli, A., Bansal, S., Malik, N., **Rana, A. K.**, and Ghosh, M. (2004). Microbiological Quality and Safety of Two Popularly Consumed Raw, Street Vended Foods in India. *Food Science and Biotechnology* **13**: 417-420.
19. Ghosh, M, **Rana, A.K.**, Bansal, S, and Ganguli, A. (2005). Predictive Microbiology: An Emerging Tool for Assessing Food Safety and Quality. *Bioinformatics India* **3**: 95-99.

Book Chapters

1. Rajvir Singh, Robin Joshi, Sanjay Kumar, Arun Kumar (2020). **Application of metabolomics to food systems. In, FOODOMICS - NOVEL OMICS TECHNOLOGIES IN FOOD SCIENCE**, published by Royal Society of Chemistry. Edited by: Professor Jorge Barros-Velazquez.

Patents

1. **Kumar, A.**, Dutt, S., Ahuja, P.S., and Kumar, S. An autoclave stable recombinant Cu/Zn superoxide dismutase with enhanced thermoflexibility (NF0050/2011). Filed in India (Application no. 1031del 2011 dated 11.4.2011).
2. Bhardwaj, P.K., **Kumar, A.**, Kishore, A., Ghawana, S., Rani, A., Singh, K., Singh, H., Singh, R.S., Kumar, H., Sood, P., Dutt, S., Kumar, S., and Ahuja, P.S. Method of cloning stable stress tolerant superoxide dismutase using degenerate primers. US Patent No. US 9212350 B2 (2015/12/15). (**Granted**).
3. Bhardwaj, P.K., **Kumar, A.**, Kishore, A., Ghawana, S., Rani, A., Singh, K., Singh, H., Singh, R.S., Kumar, H., Sood, P., Dutt, S., Kumar, S., and Ahuja, P.S. Method of cloning stable stress tolerant superoxide dismutase using degenerate primers. European patent Publication no. EP2268661 (Other details: Application no. EP20090727645; PCT no. A2909727645.5; publication date: January 5, 2011).

Technology Transfer

A gene of Cu,Zn SOD was engineered by mutation of a single amino acid that enhanced the thermostability of the enzyme to two fold. The engineered version of the enzyme (C95A; cysteine 95 of protein was mutated to alanine) has been **patented and the enzyme has been licensed to industry**. Details are appended below:

3rd April, 2014, transferred technology to M/s PHYTO BIOTECH™, Kolkata for production of unique autoclavable superoxide dismutase (SOD) enzyme (<http://www.tribuneindia.com/2014/20140405/himachal.htm#13>; <http://www.phytoprotech.in/superoxide-dismutase.html>) (MoU signed on 28th Feb, 2014).

Presentations/participations (national and international)

1. Participated in “3rd ARRW International Symposium on Frontiers of Rice Research for Improving Productivity, Profitability and Climate Resilience” held at ICAR-National Rice Research Institute, Cuttack, Odhisha, India from 6th -9th February, 2018. (**Participation**).
2. Participated in “Har Gobind Khorana Memorial Symposium on Genes, Genomes & Membrane Biology” held at NABI-Mohali, India from 03-05 December, 2017. (**Participation**).
3. **Kumar, A.** Understanding the molecular determinants of resistance to *Verticillium dahliae*: from trials and tribulations to successes and prospects. A special seminar at Department of Horticulture, UW-Madison, WI, USA. (**Oral talk**).
4. **Kumar, A.**, Jansky, S., Endelman, J., Halterman, D. QTL mapping and candidate gene discovery in potato for resistance to the *Verticillium* wilt pathogen *Verticillium dahliae*. From: August 05-09, 2017 at San Antonio, Texas, USA. (**Poster presentation**).
5. **Kumar, A.**, Jansky, S., Endelman, J., Halterman, D. Molecular Determinants of Resistance to *Verticillium dahliae*. From 23-27, July, 2017 at Fargo, North Dakota, USA. (**Oral talk**).
6. **Kumar, A.**, Jansky, S., Halterman, D. Identification of genetic determinants of *Verticillium* wilt resistance in potato. From: January 13-19, 2017 at Plant & Animal Genomics XXIV-2016, San Diego, USA. (**Poster presentation**).
7. Ames, M., Rouse, D., **Kumar, A.**, and Jansky, S. Data integration and knowledge

- management to facilitate research on plant-pathogen interactions: case study *Solanum tuberosum* – *Verticillium* wilt. From: January 13-19, 2017 at Plant & Animal Genomics XXIV-2016, San Diego, USA. **(Poster presentation)**.
8. **Kumar, A.** *Verticillium* wilt studies in potato: genotyping and phenotyping. NCCC215-2016 Potato Breeding and Genetics Technical Committee Meeting at Holiday Inn Express at O’Hare, Chicago, Illinois from December 5-6, 2016. **(Oral talk)**.
 9. Karre, S., Dhokane, D., **Kumar, A.**, Kushalappa, A.C. Barley chitin elicitor receptor kinase (HvCERK1) confers resistance against *Fusarium graminearum*: 8th Canadian Workshop on Fusarium Head Blight, At Hotel Delta Ottawa, Canada from Nov. 20-22, 2016.
 10. **Kumar, A.**, Halterman, D., Rouse, D., Jansky, S. Evaluation of resistance in potato genotypes against race 1 and race 2 strains of *Verticillium dahlia*. From: July 31–August 4th, 2016 at 100th Annual Meeting of The Potato Association of America at Grand Rapids, Michigan, USA **(Oral talk)**.
 11. **Kumar, A.**, Halterman, D., Rouse, D., Jansky, S. Segregation of unknown signaling components in potato complicates marker-assisted selection for *Ve*-mediated *Verticillium* resistance. From: July 17–21, 2016 at IS-MPMI XVII Congress, Portland, Oregon, USA. **(Poster presentation)**.
 12. **Kumar, A.** A unified forward and reverse genetics approach to dissect potato-disease resistance mechanisms against *Verticillium dahliae*. Oral presentation at ABCDS seminar series organized by USDA vegetable crop research unit at Department of Horticulture, UW, Madison, USA on 30th March 2016 <http://vcru.wisc.edu/simonlab/abcds/index.html> **(Oral talk)**.
 13. **Kumar, A.**, Kushalappa, A.C. *WIN1* transcription channelizes free fatty acids to enforce cuticle in barley spikelets to confer fusarium head blight resistance. From: January 9-13, 2016 at Plant & Animal Genomics XXIV-2016, San Diego, USA. **(Poster presentation)**.
 14. **Kumar, A.**, Kushalappa, A.C. Metabolo-genomics revealed the involvement of fatty acids in cuticle biosynthesis in barley against fusarium head blight. At 20th Penn State Plant Biology Symposium on May 13-16, 2015 University Park, Pennsylvania, USA. **(Poster presentation and Oral talk)**.
 15. **Kumar, A.** Understanding molecular mechanisms of *verticillium* wilt in potato. NCCC215 Potato Breeding and Genetics Technical Committee Meeting Holiday Inn Express at O’Hare, Chicago, Illinois from December 7-8, 2015 **(Oral talk)**.
 16. Participated in 5th annual plant sciences symposium on “*Leveraging Data in Plant Sciences: In Vivo, In Vitro, In Silico*” on November 5th, 2015 at Wisconsin Institute of Discovery, University of Wisconsin, Madison, USA. **(Participation)**.
 17. **Kumar, A.**, Dutt, S., Bagler, G., Ahuja, P.S., Kumar, S. Mutation of free Cys-95 to Ala at dimer interface of Cu,Zn superoxide dismutase enhances thermostability. Abstract published in 27th Annual Symposium of The Protein Society (USA) in the “Protein Science” Special issue: Volume 22, Issue Supplement S1, Pages i-ii, 1-258, August 2013. **(Abstract)**.
 18. **Kumar, A.**, Bhardwaj, P.K., Dutt, S., Kumar, S., Ahuja, P.S. Autoclavable and low temperature operative superoxide dismutase. Poster presented in the XVIIIth International Botanical Congress held at Melbourne, Australia from 23rd -30th July, 2011. **(Poster presentation)**.

presentation).

19. **Kumar, A., Bhardwaj, P.K., Dutt, S., Kumar, S., Ahuja, P.S.** Bioprospecting western Himalayan flora for thermostable Cu/Zn superoxide dismutases. National Symposium on Plant Propagation, conservation, Modification and Characterization & 30th Annual Meeting of Plant Tissue Culture Association (India). Institute of Himalayan Bioresource Technology Palampur, April 3-4, 2009. Abstract no. 102. Page no. 64. **(Poster presentation).**
20. Participated in 13th International Conference on “Genomics and Future of Medicine”, in Hyderabad (India) held on 27th September-30th September, 2008. **(Participation).**

Invited Lectures

1. Delivered a seminar entitled “Dissecting disease resistance mechanisms in potato for verticillium wilt” at Vegetable Science department of Punjab Agricultural University, Ludhiana on 07-03-2017.
2. Molecular determinants of resistance in plants against fungal diseases at CAFT training, Department of Plant Breeding and Genetics, PAU, Ludhiana in Aug. 2019.

Theses and Projects Supervision

1. Master thesis:
2. Mentoring an undergraduate student, Caroline Marie Hanson under undergraduate research scholars program at the University of Wisconsin-Madison, USA - (2016-2017).
3. Co-supervised several undergraduate research trainees (Ruhi Bansal, Deepanjot Sidhu, Surbhi Bhardwaj, at CSIR-Institute of Himalayan Bioresource Technology, Palampur, H.P. INDIA.

Workshops/Trainings

1. Participated in State Level Biosafety Capacity Building Workshop under the UNEP-GEF supported Phase-II Capacity Building Project on Biosafety at PAU, Ludhiana on February 16, 2018.
2. Training Program on Intellectual Property Rights (October 4-6, 2004), sponsored by National Bioresource development Board (Department of Biotechnology, Government of India, New Delhi).
3. Successfully completed core training on “Workplace Hazardous Material Information System (W.H.M.I.S) conducted by McGill University Environment Health and Safety Operations at McGill University, Montreal, Canada on Oct. 07, 2013.
4. Training on thermal and near infra-red imaging as precision agriculture tools at Phenotyping laboratory, Washington State University, Pullman, USA from 04-03-2017 to 04-07-2017.

Extension and Outreach Activities

1. Participated in Kisan Mela at PAU, Ludhiana, from 24th-25th March, 2018.
2. Participated in WPVGA Grower Education Conference and Industry Show at Stevens Point, Wisconsin, USA from February 2-4, 2016.
3. Actively Participated in Science expedition as a presenter at Institute of Discovery, UW-Madison organized by UW-Madison Science Outreach and UW Science Alliance on 2nd April, 2016.

4. Presented at STEM program for woman at University of Wisconsin- Milwaukee, Stevens Point, USA on 27-02-2016.

Membership of Professional Societies

1. The Potato Association of America, “A Professional Society for Advancement of the Potato Industry”.
2. The American Phytopathological Society (APS).
3. International society for Molecular Plant-Microbe Interaction (IS-MPMI).
4. International Plant Proteomics Organization (INPPO).

Reviewer of Scientific Journals

1. BMC genomics (BioMed Central)
2. Genomics (Elsevier)
3. Environmental and Experimental Botany (Elsevier)
4. Phytochemical Analysis (Wiley)
5. Plant Disease (American Phytopathological Society)
6. Scientific Reports (Nature Publishing Group)
7. Functional and Integrative Genomics (Springer)
8. Plant Biology (Wiley)
9. Journal of Cereal Science (Elsevier)
10. American Journal of Potato Research (Springer)
11. HortScience (American Society for Horticultural Science)
12. Evolutionary Bioinformatics (SAGE journals)
13. Journal of Food Processing and Preservation (Wiley)
14. Journal of Food Science and Technology (Springer)
15. OPEN AGRICULTURE (DE/G)
16. Reviewer of proposed book entitled “Food Safety – Grain Based Foods by Editor Bianchini et al” for Elsevier Publishing Group.

Member of National / International Committees for evaluation / funding / review of scientific research

1. Technical expert panel member for BIRAC’s (Biotechnology Industry Research Assistance Council) Biotechnology Ignition (Grant) funding program to evaluate proposals at IIT, Kanpur in 2018 & 2019.
2. Technical reviewer of BIRAC’s BIG funding program to evaluate proposals.

Awards and Fellowships

1. Awarded with prestigious “**Ramanujan Fellowship**” by SCIENCE & ENGINEERING RESEARCH BOARD, DST, GOI for the research project.

2. **Shimamoto Travel Award** to attend the IS-MPMI XVII Congress, July 17-21, 2016 in Portland, Oregon, USA.
3. **Start Up Research Grant (Young Scientist)**, by SCIENCE & ENGINEERING RESEARCH BOARD, DST, GOI for the research project "Cisgenetic engineering of rice (*Oryza sativa*) susceptible elite cultivars for enhanced disease resistance using genome editing CRISPR/Cas9 technology". **(Didn't avail it)**.
4. **Travel Grant** to attend 20th Penn State Plant Biology Symposium on May 13-16, 2015 University Park, Pennsylvania, USA.
5. Conferred "**Protein Science Young Investigator Travel Grant**" from The Protein Society, USA to attend "The Protein Symposium-2013" held at Boston, MA, USA.
6. **Travel grant** from Department of Science and Technology (DST) and perdem from Indian National Science Academy (INSA), Govt. of India to attend 13th International Botanical Congress at Melbourne, Australia in 2011.
7. Awarded with "**CSIR-Senior Research Fellowship**" in 2008.
8. Successfully qualified "**CSIR-UGC Test for lectureship (NET)**" in Dec 2004 in *Life Sciences* awarded by Council of Scientific and Industrial Research (CSIR), Govt. of India.
9. Successfully qualified "**Graduate aptitude test for engineering (GATE)**" with 94.82 percentile in 2004 conducted jointly by the Indian Institute of Science and seven Indian Institutes of Technology.
10. Received "**National merit certificate**" in recognition of high position secured in the list of meritorious candidates qualifying for awards from HP Board in 1995.

Academic Referees

1. Dr. Sanjay Kumar (Ph. D Superivsor, CSIR-IHBT)

Senior Principal Scientist and Director
Biotechnology Division,
CSIR-Institute of Himalayan Bioresource Technology,
Palampur, H.P. - 176061
Email: sanjaykumar@ihbt.res.in, sanjayplp@rediffmail.com
Tel. Off. +91-1894-230742, Mobile: +91- 9816621463, Fax: +91-1894-230433

2. Dr. Kashmir Singh (Ph. D Superivsor, PU, Chandigarh)

Assistant Professor,
Department of Bio-Technology, Plant molecular biology lab,
Punjab University, BMS Block-I, Sector 25, Chandigarh 160014, India
Email: kashmirbio@pu.ac.in, kashmir123@gmail.com
India, Tel. +91-172-2534076, Mobile: +91-9501684096, Fax: +91-172-2541409

3. Dr. Ajjamada C Kushalappa (Postdoc Superivsor)

Associate Professor
Plant Science Department
McGill University
Ste. Anne de Bellevue
Quebec, Canada H9X3V9
Email: ajjamada.kushalappa@mcgill.ca
Tel: +1-514-398-7851, FAX: +1-514-398-7897

4. Dr. Shelley Jansky (Postdoc supervisor)

Research Geneticist, USDA/ARS-Vegetable Crop Research Unit, Madison
Professor, Department of Horticulture
University of Wisconsin-Madison
1575 Linden Drive
Madison, WI 53706
Email: shjansky@wisc.edu, shelley.jansky@ars.usda.gov
Tel: +1- 608-262-8324