VINAY KUMAR

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Centre for Plant Sciences
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ACADEMIC RECORDS

- Ph.D. in Life Sciences (Biotechnology) from Biotechnology Division of CSIR-Institute of Himalayan Bioresource Technology (Advisor: Dr. Sudesh Kumar, Scientist, Year: 2013), Palampur and Biotechnology Division of Guru Nanak Dev University, Amritsar
- M.Sc. (Biochemistry, Year: 2005) from Department of Biochemistry, Kurukshetra University, Kurukshetra
- B.Sc. (Medical, Year: 2002) from D.N.P.G. College, Hisar (Kurukshetra University)

TEACHING EXPERIENCES

Aug, 2015-onwards, Assistant Professor, Department of Plant Sciences, Central University of Punjab, Bathinda

DETAILS OF TEACHING COURSES

- Plant Metabolic Engineering
- Research Methodology
- Techniques in Life Sciences
- Plant Tissue Culture
- Recombinant Technology
- Biochemistry

STUDENT DETAILS:

- Completed M.Sc. students: 12
- Present M.Sc. students: 04
- Present Ph.D. student: 02

AREAS OF SPECIALIZATION

- Plant Biotechnology
- Agricultural Biotechnology
- Genetic Engineering

SIGNIFICANT CONTRIBUTION, INVENTION OR OTHER CONTRIBUTIONS

- The comparative analysis of chickpea cultivars in term of small organic compounds helps to identify cultivar specific metabolites.
- The importance of sgRNA in the CRISPR-Cas9 technology is highlighted especially for use in plants.
- The draft proposal for utilization of CRISPR-Cas9 technology is provided for use in Cotton plant.
- Contributed in identification of cultivars specific molecular signatures associated with seed development and seed/weight determination in chickpea.
- Contributed in development of CTDB, an integrated chickpea transcriptome database for functional and applied genomics.
- Importance of *CsANR* and *CsDFR* encoding anthocyanin reductase and dihydroflavonol reductase of flavonoid biosynthesis pathway was documented through raising transgenic tobacco. Such transgenic tobacco show improved morphological features, induced early flowering and provided tolerance against *Spodoptera litura*.
- Contributed towards the development of a rapid, efficient, and quiet economical protocol for functional analysis of genes in tea like woody and perennial plants.
- Contributed towards production of a low-caffeine phenotype in a Kangra Jat tea clone through RNAi.
- Significantly contributed towards the transcriptome and epigenome diversity analysis during seed development for discovery of molecular markers and gene regulatory mechanism in chickpea.

PRESENT RESEARCH HIGHLIGHTS

- Exploring the complexity during development of female gametophyte after fertilization in Chickpea. This work is sponsored by UGC-Start up grants. It involves Deep Sequencing for Identification of Reproductive Organ(s) Enriched transcripts after Fertilization in Chickpea for understanding the embryo abortion. This work will significantly help for better understanding of improving yield in plants.
- Analysis of epigenome diversity during callus formation in recalcitrant plants. This work is financial supported in form of Research Seed money from central university of Punjab. This work involves In-depth Understanding of Epigenetic Regulations during Callus Formation in Plants to understand the cellular differentiation process for somatic embryogenesis and helps to get deep insight for callus formation for recalcitrant plants.

RESEARCH EXPERIENCES

- October 2013-August 2015, Research Associate. National Institute of Plant Genome Research, New Delhi (India) *Advisor*: Dr. Mukesh Jain, Scientist. *Project*: Transcriptome and epigenome diversity analysis during seed development for discovery of molecular markers and gene regulatory mechanism in chickpea.
- April 2013-October 2013, Research Associate. Agricultural Biotechnology Department, CSK Himachal Pradesh Agricultural University, Palampur, Himachal Pradesh (India) *Advisor*: Dr. Rajiv Rathour, Senior Scientist. *Project*: Exploitation of resistance gene derived markers (GDMs) for the development of blast and bacterial blight resistance version of rice

var. HPR2143.

- April 2010-March 2013, Senior Research Fellowship. Biotechnology Division, CSIR-Institute of Himalayan Bioresource and Technology, Palampur, Himachal Pradesh (India) *Advisor*: Dr. Sudesh Kumar Yadav, Senior Scientist. *Project*: Metabolic engineering of tobacco with dihydroflavonol 4-reductase and anthocyanidin reductase for analyzing the influence on flavonoids and antioxidants.
- May 2007-April 2010, Project Assistant Level-II. Biotechnology Division, CSIR-Institute of Himalayan Bioresource and Technology, Palampur, Himachal Pradesh (India) *Advisor*: Dr. Sudesh Kumar Yadav, Senior Scientist. *Project*: Producing decaffeinated tea through RNAi technology.

PEER REVIEWED PUBLICATIONS

1. Uniyal AP, Mansotra K, Yadav SK, **Kumar V** (2019) An overview of designing and selection of sgRNAs for precise genome editing by the CRISPR-Cas9 system in plants. 3Biotech 9, 23-42.
2. Uniyal AP, Yadav SK, **Kumar V** (2019) The CRISPR-Cas9, Genome editing approach: a promising tool for drafting defense strategy against begomoviruses including cotton leaf curl viruses. J Plant Biochem Biotechnol 28, 121-132.
3. Kumar R, Kumar R; Sharma D, Garg M, **Kumar V**, Agarwal M (2018) Macromolecular Crowding-Induced Molten Globule States of the Alkali pH-Denatured Proteins. BBA-Proteins and Proteomics 1866, 1102-1114
4. Kumar R, Sharma D, **Kumar V**, Kumar R (2018) Factors Defining the Effects of Macromolecular Crowding on Dynamics and Thermodynamic Stability of Heme Proteins In-vitro. Archives of Biochemistry and Biophysics 654, 146-162.
5. Garg R, Singh VK, Rajkumar MS, **Kumar V**, Jain M (2017) Global transcriptome and co-expression network analyses reveal cultivar-specific molecular signatures associated with seed development and seed size/weight determination in chickpea. The Plant Journal, 10.1111/tpj.13621
6. **Kumar V**, Yadav SK (2016). Pyramiding of tea dihydroflavonol reductase and anthocyanidin reductase increases flavan-3-ols and improves protective ability under stress conditions in tobacco. 3Biotech 7, 1-14.
7. Joshi R, Rana A, **Kumar V**, Kumar D, Padwad YS, Yadav SK, Gulati A. (2016). Anthocyanin enriched purple tea exhibits antioxidants, immuno-stimulatory and anticancer activities. Journal of Food Science and Technology 54:1953-1963.
8. Verma M, **Kumar V**, Patel RK, Garg R, Jain M. (2015). CTDB: An integrated chickpea transcriptome database for functional and applied genomics. *PLoS ONE* doi: 10.1371/journal.pone.0136880.
9. **Kumar V**, Jain M. (2015). CRISPR-Cas system for plant genome editing: advances and opportunities. *Journal of Experimental Botany* 66: 47-57.
10. **Kumar V**, Nadda G, Kumar S, Yadav SK (2013). Transgenic tobacco overexpressing tea cDNA encoding dihydroflavonol 4-reductase and anthocyanidin reductase induces early flowering and provides biotic stress tolerance. *PLoS ONE* 8: e65535.
11. Kumar V, Guleria P, **Kumar V**, Yadav SK (2013). Gold nanoparticles exposure induces growth and yield enhancement in *Arabidopsis thaliana*. *Science of the Total Environment* 461-462: 462-468.
12. **Kumar V**, Yadav SK (2013). Overexpression of *CsDFR* and *CsANR* enhanced root

flavonoids and improved root architecture to provide tolerance against aluminum toxicity in tobacco. *Plant Root* 7: 65-76.

13. **Kumar V**, Yadav SK (2013). Overexpression of *CsANR* increased flavan-3-ols and decreased anthocyanins in transgenic tobacco. *Molecular Biotechnology* 54: 426-435.
14. **Kumar V**, Gill T, Grover S, Ahuja PS, Yadav SK (2013). Influence of human lactoferrin overexpression on iron homeostasis, flavonoids and antioxidants in transgenic tobacco. *Molecular Biotechnology* 53: 118-128.
15. **Kumar V**, Yadav SK (2012). Developmental effect on flavan-3-ols content of leaf and flower in tea (*Camellia sinensis* (L.) O. Kuntze). *International Journal of Plant Developmental Biology*. 6: 15-20.
16. Mohanpuria P, **Kumar V**, Ahuja PS, Yadav SK (2011). Producing low-caffeine tea through post-transcriptional silencing of *Caffeine synthase* mRNA. *Plant Molecular Biology* 43: 104-111.
17. Mohanpuria P, **Kumar V**, Ahuja PS, Yadav SK (2011). *Agrobacterium*- mediated silencing of caffeine synthesis through root transformation in *Camellia sinensis* L. *Molecular Biotechnology* 48: 235-243.
18. Mahajan M, **Kumar V**, Ahuja PS, Yadav SK (2011). Effects of flavonoid-mediated free IAA regulation on growth and development of *in vitro*-grown tobacco seedlings. *International Journal of Plant Developmental Biology* 5: 42-48.
19. Mohanpuria P, **Kumar V**, Mahajan M, Mohammad H, Yadav SK (2010). Gene silencing: theory, techniques and applications. *International Journal of Medical and Biological Frontiers* 17: 4-5.
20. Mohanpuria P, **Kumar V**, Yadav SK (2010). Tea caffeine: metabolism, functions and reduction strategies. *Food Science and Biotechnology* 19: 275-287.
21. Rana NK, Mohanpuria P, **Kumar V**, Yadav SK (2009). A *CsGS* is regulated at transcriptional level during development stages and nitrogen utilization in *Camellia sinensis* (L.) O. Kuntze. *Molecular Biology Reports* 37: 703-710.
22. Mohanpuria P, **Kumar V**, Joshi R, Gulati A, Ahuja PS, Yadav SK (2009). Caffeine biosynthesis and degradation in tea [*Camellia sinensis* (L.) O. Kuntze] is under developmental and seasonal regulation. *Molecular Biotechnology* 43: 104-111.
23. **Kumar V**, Yadav SK (2009). Proline and betaine provide protection to antioxidant and methylglyoxal detoxification systems during cold stress in *Camellia sinensis* (L.) O. Kuntze. *Acta Physiology Plantrum* 31: 261-269.

BOOK/BOOK CHAPTERS

1. Yadav SK, **Kumar V**, Singh SP (Eds) (2018) Recent Trends and Techniques in Plant Metabolic Engineering. Hardcover ISBN 978-981-13-2250-1. DOI: 10.1007/978-981-13-2251-8 (**Book)**
2. Rubal, Dhawan A, **Kumar V**. (2018) Flavonoids Accumulation as Adaptation Response in Plants during Abiotic Stresses in: Akula Ramakrishna and Sarvajeet Singh Gill (eds) Metabolic Adaptation in Plants During Abiotic Stress. Taylor & Francis Group, Boca Raton, FL.
3. **Kumar V**, Mahajan M, Yadav SK (2012). Toxic metals accumulation, tolerance and homeostasis in brassicaoilseed species: overview of physiological, biochemical and molecular mechanisms. In: N. A. Anjum et al. (eds), The Plant Family Brassicaceae: Contribution Towards Phytoremediation, Environmental Pollution 21, Springer Heidelberg,

pp 171-211.

4. Guleria P, Goswami D, Mahajan M, **Kumar V**, Bhardwaj J, Yadav SK (2012). MicroRNAs and their role in plants during abiotic stresses. In: Parvaiz A and Prasad MNV, eds. Environmental Adaptations and Stress Tolerance of Plants in the Era of Climate Change. Springer Heidelberg, pp 265-278.
5. Mohanpuria P, **Kumar V**, Mahajan M, Mohammad H, Yadav SK (2011). Gene silencing: theory, techniques and applications In: Michael T. Loback and Jennifer N. Trevino, eds. Encyclopedia of Genetics Research. Volume 3, Nova Science Publishers, Hauppauge, New York, USA, pp 610-623.
6. Mohanpuria P, **Kumar V**, Mahajan M, Mohammad H, Yadav SK (2011). Gene silencing: theory, techniques and applications In: Leon V. Berhardt, ed. Advances in Medicine and Biology. Volume 32, Nova Science Publishers, Hauppauge, New York, USA, pp 217-230.
7. Mohanpuria P, **Kumar V**, Mahajan M, Mohammad H, Yadav SK (2010). Gene silencing: theory, techniques and applications In: Anthony J. Catalano, ed. Gene Silencing: Theory, Techniques and Applications, Nova Science Publishers, Hauppauge, New York, USA, pp 321-334.
8. Mahajan M, **Kumar V,** Yadav SK (2010). Alkaloids: properties, application & pharmacological effects In: Nicole M. Cassiano, ed. Alkaloids: Properties, Application & Pharmacological effects. Nova Science Publishers, Hauppauge, New York, USA, pp 1-36.

FELLOWSHIPS, HONORS, AND AWARDS

1. **International Travel Grant** (2012). Received for participating in Keystone Symposia Conference on 'Plant Abiotic Stress and Sustainable Agriculture: Translating Basic Understanding to Food Production' held during 17-22nd Jan 2013 at Taos (U.S.A.) from Department of Science and Technology, India and Department of Biotechnology, India.
2. **AU-CBT Excellence Award** (2011). Biotech Research Society of India (BRSI) awarded this award in recognition of excellent work and achievements in Plant Biotechnology during doctoral studies
3. **Senior Research Fellowship** (2009). HRDG-CSIR awarded stipend-bearing fellowship in Life Science
4. **CSIR-UGC National Eligibility Test** (2005). Passed highly prestigious CSIR-UGC National Eligibility Test in Life Science conducted by HRDG CSIR
5. **Merit Holder** (1997). Stands in Merit List during Matriculation Examination

SCIENTIFIC MEMBERSHIPS

1. Life Membership of Enlisted Professional Bodies-
   I. Society of Biological Chemist, India
   II. Biotech Research Society, India.
   III. Prof. H.S. Srivastava Foundation for Science and Society, India
   IV. The Indian Science Congress Association, India
2. Editorial Board Member (2013-onward). Frontiers in Plant Science (Section- Plant Metabolism and Chemodiversity) as Review Editor
3. Reviewer of Journal of Experimental Botany (2014 onwards)