

## CURRICULUM-VITAE OF DR. KAVITA SHAH

**Name** : Dr.(Mrs) Kavita Shah

### **Academic Affiliation and Address:**

Dean and Head  
Professor  
Institute of Environment &  
Sustainable Development (IESD)  
Banaras Hindu University  
Varanasi-221005, INDIA  
Mob: +91 9450955423  
Ph : +91 542 6703555  
Fax : +91 542 2369359

E-mail: [dean.iesdbhu@gmail.com](mailto:dean.iesdbhu@gmail.com)  
[kavitashah@bhu.ac.in](mailto:kavitashah@bhu.ac.in)

**Educational Qualifications: M.Sc, Ph.D. (Specialization: Environmental Biochemistry and Biotechnology)**

### **Post Doctoral Experience:**

- Awarded and availed Swiss Post Doctoral Fellowship to Foreign Students funded by Swiss Federal Commission at University of Geneva, Switzerland (2001-2002).
- Scientist Pool Officer, CSIR at Banaras Hindu University (2000-2001).
- STA Post doctoral Fellow in Japan funded by Japan Science and Technology and Japan International Science and Technology Exchange Program at National Institute of Health Sciences, Tokyo, Japan (1997-2000).
- Research Associate, CSIR at Banaras Hindu University (1995-1997).

### **Academic Membership :**

- (i) Life Member of **Indian Science Congress** (f. 1993 onwards). Membership No. **L-8152**
- (ii) Life Member of **Society of Biological Chemists**, India (f. 1994 onwards). Membership No. **1007**.
- (iii) Member of **Canadian Society of Plant Physiologists**, Canada (f. Jan,1999 onwards).
- (iv) Member of **BHU Alumni Association** since Dec 2004.
- (v) Life Member of **Biotechnological Research Society of India** (f.2009 onwards). Membership No. **LM 812**.
- (vi) Life member of **The National Academy of Sciences**, India (f.2010 onwards).
- (vii) Life Member of the **Society of Agricultural Biochemists** of India (f.2010 onwards).
- (viii) Life member of the **Indian Society of Plant Physiologists**(f.2010 onwards).

**Have guided more than 09 Ph. D. students / 02 M. Phil. Students/ 24 M. Sc. Dissertations.**

### **Organizing Secretary or Coordinator for Conferences/Symposia/Workshops/Refresher Course**

- (i) National Symposium on Recent Advances in Toxicological Studies: Molecular and Physiological Aspects, February 27-28, 2008, Mahila Mahavidyalaya, Banaras Hindu University, Varanasi.
- (ii) National Workshop on Role of Higher Education in Disaster Management In India : Issues and Challenges, April 29-30, 2011, Institute of Environment and Sustainable Development, BHU, Varanasi.
- (iii) Workshop on Conservation of Ganges River Dolphin, July 28-30, 2011, Institute of Environment and Sustainable Development, BHU, Varanasi and Centre for Environment Education, Lucknow at BHU, Varanasi.
- (iv) Coordinator for the 4<sup>th</sup> Refresher Course in Environmental Studies held during Oct 01-21, 2011 at Academic Staff College, BHU, Varanasi
- (v) National Seminar on Water Resource Management in an Era of Changing Climate, January 10-11, 2014 at RGSC, BHU, Mirzapur campus.

### **Experience in Educational Administration:**

1. Member of The BHU International Advisory Committee 2006-2008, 2008-2010, 2010-2013.
2. Acting Coordinator for M.Sc. Bioinformatics Course at MMV (Dec 2010-March 2011).
3. Member of the Panel of Judges for National Children SCIENCE Congress,U.P. Held during 26-27,November, 2002 at Varanasi.
4. Member of the BHU School Board (2010-2011).
5. Convener of the University Task Force for Stakeholders Participation under Roshni Initiative at BHU.
6. Member of the University Residential Accomodation Allotment Committee (2011- onwards).
7. Course-Coordinator for M.Sc.(Tech) Environmental Science and Technology Course, RGSC, BHU (2012 onwards).
8. Member of the Admission Committee for B.Sc. III (Hons) (2005-2010).
9. Secretary for the Hindi Rajbhasha Committee at MMV, BHU (2005-2010).
10. Incharge of the Central Instrumentation Laboratory at MMV from Feb 2006-Feb 2011.
11. Observer, Evaluator and Tabulator with the Controller of Examinations, BHU (2005-onwards).
12. Member of Advisory Board, National Seed Research and Training Centre (Varanasi), Ministry of Agriculture, Govt. of India (2005-onwards).
13. Member of the Admission Committee for M.Sc. (Biochemistry, 2003-05) at North Eastern Hill University, Shillong.
14. Member of the Board of Under graduate studies at NEHU for 2004-2005.
15. Member of the Organizing Committee for the Seminar on Advances in Biochemical Education and Research, Feb 25-26, 2005, held at Department of Biochemistry, NEHU, Shillong.
16. Joint Secretary, NEHUTA, Cooperative Society, NEHU 2004-2005.
17. National Coordinator, North East Region for International Treatise Series in Advances in Plant Physiology, Ed. A. Hemantaranjan, BHU, from 2003 onwards continuing.
18. Member of the NEHU Welfare Committee 2005-2006.
19. Resource person for Orientation and Refresher Courses in Life Sciences at NEHU,IIVR,NSTRC.
20. Paper Setter and Examiner (theory and practicals) for Biochemistry, Nutrition, Home Science, Clinical Dietetics, etc. at UG levels for BHU, NEHU, Gorakhpur University.
21. Paper Setter and Examiner (theory and practicals) for Biochemistry, Immunology, Bioinformatics at PG level for BHU and NEHU.
22. Member, Editorial board, for proceedings of Bioinformatics and Computational Biology,

- published by MMV, BHU and DBT, with Ed. D. Swati, 2006-07.
23. Member of the Organizing Committee for the Student Research Convention, Anveshan 2009, held at Banaras Hindu University, Varanasi, Feb 9-11, 2009
  24. Member of the Organizing Committee for the International Conference on Emerging Trends in Biotechnology and 6th Annual Convention of BRSI held at Banaras Hindu University, Varanasi, December 4-6, 2009
  25. Member of the Organizing Committee for the International Conference on Role of Biomolecules in Food Security and Health Improvement and XI Silver Jubilee Convention of Indian Society of Agricultural Biochemists ICBFH-2010 held at Banaras Hindu University, Varanasi, Feb 17-20, 2010.
  26. Member of Theatre Events Management Committee for short Plays/Skit/Mime/Mimicry/Monoacting/Expression during Inter-Faculty Youth Festival “Spandan 2010” held from 01.02.10 to 05.02.10, at BHU, Varanasi.
  27. Member of Committee constituted to “Organize Special Lectures” in Faculty of Science, BHU for the session 2010-11.
  28. Member of the Organizing Committee for the National Conference of Plant Physiology’, Physiological and Molecular Approaches for Crop Improvement under Changing Environment”, held on November 25-27, 2010 jointly organized by Department of Plant Physiology, Institute of Agricultural Sciences, BHU and Indian Society for Plant Physiology, New Delhi.
  29. Member of the following committees at MMV:-
    - (i) Academic forum
    - (ii) Creative forum
    - (iii) Public Relations and Press Report Committee
    - (iv) Computer committee
    - (v) Citation committee
  30. Member of committee for Prevention of Ragging on MMV Campus 2006-2010 and IESD 2012.

#### **Distinctions/Prize/Medal/Awards received :**

- Awarded the prestigious “**Women Scientist Award-2011**” of **The Biotech Research Society, India** in recognition of pioneering work in the field of Enzyme Technology and Biosensors on 21<sup>st</sup> November, 2012.
- Felicitated by Rotary Club of Varanasi Greater as an **Outstanding Teacher** on 05th September **2009**.
- Awarded “**Medhavi Chattra Puraskar**” by the Directorate of Higher Education, Allahabad in 2003 for securing 1<sup>st</sup> rank in B.Ed. exams of BHU in 1992.
- Awarded and availed **Swiss Government Fellowship for Foreign students** and worked with **Prof. Claude Penel** at the University of Geneva, **Switzerland**, from October 2002-September 2003.
- Awarded **Senior Research Associateship** (Scientist’s Pool) from Dec 2000 to April 2003, by Council of Scientific and Industrial Research, New Delhi
- Awarded **Young Scientist Travel Fellowship Award**, to present a paper at 18<sup>th</sup> International Union of Biochemistry and Molecular Biology Congress held during July 13-21<sup>st</sup>, 2000, Birmingham, U.K.
- Awarded and availed the prestigious ‘**STA FELLOWSHIP**’ (Science and Technology Agency), granted by JISTEC (Japanese Institute for Science and Technology Exchange Center and JST (Japan Science and Technology), Ministry of Health Sciences, Tokyo, **JAPAN** for one

year from June 1998-June 1999 and worked with **Dr. Tamio Maitani**, Section Chief, Division of Food Additives, National Institute of Health Sciences, **TOKYO**.

- Awarded and availed **Research Associateship** from October 1996 to 2001, granted by **Council of Scientific and Industrial Research**, New Delhi.
- Received 1996 '**YOUNG SCIENTIST MERIT AWARD**' at 83<sup>rd</sup> Session of Indian Science Congress held at Patiala, during Jan 3-7, 1996.
- Awarded **UGC-GATE Senior Research Fellowship** from 1995 to 1996, by University Grants Commission, New Delhi.
- Awarded **UGC-GATE Junior Research Fellowship** from 1993 to 1995, by University Grants Commission, New Delhi.
- Received **Best Paper Presentation Award** in the IV<sup>th</sup> Convention of Agricultural Biochemists and Symposium on Recent Developments in Biochemistry, held at Varanasi on March 20-21, 1995.
- Awarded '**BHU GOLD MEDAL**' and cash prize for Rs 300/- for obtaining First Rank in B. Ed. examination of Banaras Hindu University held in 1992.

#### **Additional qualifications**

- Qualified **Graduate Aptitude Test in Engineering (GATE-93)** for Life Sciences in 1993 with a percentile score of 88.4.
- Qualified **TOEIC-98-99** (Test of English for International Communication) with a score of 900/1000 and a percentile of 98.0.

#### **Major Research Contributions :**

Study of the effect of abiotic stressors on tolerance, toxicity and signalling in rice, metal detoxification, transgenics development, are some of other areas of work. Have made a novel contribution in the field of Metabolism, Molecular Biochemistry and Enzymology by isolating different molecular forms of RNAses from rice parts and characterising, biochemically a cadmium inducible protein binding complex, from roots of rice plants (*Plant Physiol. Biochem., Paris, 33, 577-584, 1995; J. Plant Physiol. Gemany, 152, 448-454, 1998*) *In vitro* and *in vivo* enzymatic studies on the nucleolytic, proteolytic and phosphorolytic events as influenced by cadmium stress in rice. Studied the Nitrate reductase holoenzyme (*J. Plant Physiol. (Germany), 151, 316-322, 1997*) and antioxidant enzymes specially superoxide dismutases and peroxidases under Cd stress and the changes in the photosynthetic efficiency of growing rice seedlings as brought about by Cd and other stressful conditions (*Plant Sci. (UK). 156, 23-34, 2000; Plant Sci. (U.K.). 161, 1135-1144, 2001*).

Worked with the phytochelatin induction in root culture tissues of *Rubia* and *Horseradish* with special emphasis to the biochemical changes brought about in the presence of Cd and glutathione on its biosynthetic enzyme  $\gamma$ -glutamyl cysteinyl transpeptidase and phytochelatin synthase using Radioisotopes and LC-MS. The work was presented at Plant Biology Canada'99 held at Saskatoon, Canada and was widely acclaimed. This postdoctoral study was carried out at National Institute of Health Sciences, Tokyo, **Japan**. Studies related to metal sulphur ratios in induced phytochelatin under metal stress has been successfully accomplished and presence of Iron induced phytochelatin has also been seen for the first time.

Purification and characterization of a pectin-binding cationic peroxidase from *Arabidopsis* leaves and its N-terminal protein sequence is a novel contribution to Plant Science (*Phytochem., U.K., 65, 307-312, 2004*). This peroxidase has similarity with P32 of zucchini important for cell wall antioxidant property. This postdoctoral work was carried at University of Geneva, Switzerland.

**Histochemical localization** of metal ions as well as enzyme peroxidase simultaneously is reported from the first time in root tissues *in vivo* in rice cultivars grown under metal stress. The antibody staining is under progress.

A major area of work also include the development of biosensors using immobilized plant enzymes (*Biotechnology and Bioprocess Engineering, 13, 632-638, 2008*) and studies pertaining to inhibitors of HIV protease (*In Silico Biology, 8-033, 2008*), HIV integrase (*Archives of Virology 2014*) and *N. meningitides* vaccine constructs (*Indian Journal of Biotechnology, 2010*) in silico using bioinformatics tools.

Dr Kavita Shah has made significant contributions in the area of Enzyme Technology and Environmental Biotechnology and Bioinformatics. Developed a rice-peroxidase-enzyme-biosensor which is the novel contribution to help monitor neurological patients for dopamine levels and help to administer proper dose of drug to the patients of Alzheimer's/Parkinson's diseases (*Talanta 2012*). Presently involved in molecularly imprinted polymers as tools for environmental monitoring and drug delivery.

Development of drought and heat stress tolerant transgenic tomato lines is an important achievement of the biotechnology work undertaken during 2012-13 (*Plant Physiol. Biochem. 2012;2013; Phytochemistry 2013; Biometals 2014*).

## List of Publications

1. Singh I. and Shah K. 2015. Evidences for suppression of cadmium induced oxidative stress in presence of sulphosalicylic acid in rice seedlings. *Plant Growth Regulation*, DOI 10.1007/s10725-015-0023-4.
2. Shah K, Singh M, Rai AC. 2015. Bioactive compounds of tomato fruits from transgenic plants tolerant to drought. *LWT-Food Science and Technology*, 61(2):609–614.
3. Singh I. and Shah K. 2014. Evidences for structural basis of altered ascorbate peroxidase activity in cadmium stressed rice plants exposed to jasmonate. *Biometals* 27:247–263.
4. Chand R, Kumar M, Kushwaha C., Shah K, Joshi AK 2014. Role of Melanin in Release of Extracellular Enzymes and Selection of Aggressive Isolates of *Bipolaris sorokiniana* in Barley. *Current Microbiology* 69:202–211.
5. Shah K., Nandi I, Singh N., 2014. Towards water security through sustainable management of water resources. *Current Science* 106, No. 6, 25 March 2014.
6. Shah K., Sharma PK, Nandi I, Singh N. 2014. Water sustainability: reforming water management in new global era of climate change. *Environmental Science and Pollution Research*, DOI 10.1007/s11356-014-2812-0.
7. Jayaswal A., Mishra A., Mishra H., Shah K 2014. Evaluation of novel Saquinavir analogs for resistance mutation compatibility and potential as an HIV-Protease inhibitor drug *Bioinformation* 10(4): 227-232.
8. Shah K, Gupta S, Mishra H, Sharma PK, Jayaswal A. 2014. Examining structural analogs of elvitegravir as potential inhibitors of HIV-1 integrase. *Archives of Virology*, 159:2069-2080. DOI 10.1007/s00705-014-2038-y.
9. Singh P and Shah K. 2014. Evidences for reduced metal-uptake and membrane injury upon application of nitric oxide donor in cadmium stressed rice seedlings. *Plant Physiology and Biochemistry*, 83:180-184.
10. Rai, A.C., Singh, I., Singh, M. and Shah, K. 2014. *Ab initio* molecular modeling and binding of zinc finger protein ZAT12 from *Brassica carinata* for abiotic stress tolerance studies. *Biometals*, Volume 27, Issue 6 (2014), Page 1231-1247.

11. Shah K, Kumar M, Chand R, 2014. Effect of Tricycalzole on morphology, virulence and enzymatic alterations in pathogenic fungi *Bipolaris sorokiniana* for management of spot blotch disease in barley. *World Journal of Microbiology and Biotechnology*, DOI: 10.1007/s11274-014-1756-3.
12. Rai A.C., Singh M., Shah K. 2013. Engineering ZAT 12 gene encoding C2H2 like zinc finger transcription factor enhances heat and drought stress tolerance in *Solanum lycopersicon* (tomato) plants. *Phytochemistry* (U.K.) 85:44-50.
13. Shah K., Singh M., Rai A.C. 2013. Effect of heat-shock induced oxidative stress is suppressed in BcZAT12 expressing drought tolerant tomato *Phytochemistry* (U.K.) 95:109-117.
14. Rai, S.K., Arora, N., Pandey, N., Meena, R.P., Shah K., Rai, S.P. 2012. Nutraceutical enriched vegetables: Molecular approaches for crop improvement. *International Journal of Pharma and Bio Sciences* 3(2):363-379.
15. Rai, A.C., Singh, M. and Shah, K. 2012. Environmental Stresses and Transgenics: Role of ZFP (ZAT) Gene in Multiple Stress Tolerance in Plants. In: *Advances in Plant Physiology. (Vol XIII.)* Ed. Hemantranjan, A. Scientific Publishers (India) Jodhpur, pp. 197-232. ISBN : 978-81-7233-798-8.
16. Singh, I., Agrawal, P. and Shah, K. 2012. In search of function of hypothetical proteins encoded by genes of SA-JA pathways in *Oryza sativa* by *in silico* comparison and structural modeling. *Bioinformation* 8(1):001-005.
17. Singh, I. and Shah, K. 2012. Crosstalk between genes in salicylic acid and jasmonic acid mediated signaling in plants exposed to environmental stresses. In : *Advances in Plant Physiology. (Vol XIII.)* Ed. Hemantranjan, A. Scientific Publishers (India) Jodhpur, pp. 250-278. ISBN : 978-81-7233-798-8.
18. Singh, P., Prakash, R. and Shah, K, 2012. Effect of organic solvents on peroxidases from rice and horseradish: prospects for enzyme based applications, *Talanta*. 97:204–210.
19. Shah, K., Singh, P. and Nahakpam S. 2012. Effect of Cadmium uptake and heat stress on root ultra structure, membrane damage and antioxidative response in rice seedlings. *Journal of Plant Biochemistry and Biotechnology* DOI 10.1007/s13562-012-0116-3.
20. Shah, K. and Nahakpam S. 2012. Heat exposure alters the expression of SOD, POD, APX and CAT isozymes and mitigates low cadmium toxicity in seedlings of sensitive and tolerant rice cultivars. *Plant Physiology and Biochemistry* 57:106-113.
21. Singh, I. and Shah, K. 2012. *In silico* study of interactions between rice proteins Enhanced disease susceptibility 1 and Phytoalexin deficient 4, a regulator of salicylic acid signaling pathway. *J. Biosciences* 37(3):563-571.
22. Rai A.C., Singh M., Shah K. 2012. Effect of water withdrawal on ROS formation, proline accumulation and activities of SOD, CAT, APX, GR and POD enzymes in ZAT12 transformed transgenic tomato plants. *Plant Physiology and Biochemistry* (Paris) 61:108-114.
23. Shah, K., Raghuvanshi, R. and Singh, I. 2011. Phosphate transporters in Symbiotic Arbuscular Endomycorrhizal Association-A Bioinformatics Approach. In : *Advances in Life Sciences* Ed. Sinha, R.P., Sharma, N.K. and Rai, A.K. IK Publishers, New Delhi, India, pp. 93-115. ISBN : 93-81141-04-5.
24. Nahakpam, S., Rai, A., Singh, I., Shah K. 2011. Calcium-pectate binding peroxidase from rice roots: Purification, stability and kinetics for analytical applications. *Proceedings of National Academy of Sciences (India), NASI, Allahabad. Vol. 81, B, Part IV, pp. 381-388. ISSN: 0369-8211.*
25. Shah, K., Rai, A.C. and Singh, V. 2011. Phylogenetic relationships in ZnT superfamily of Zinc ion Transporters *in silico*. *Journal of Proteins and Proteomics* 2(2), July-December 2011, pp. 99-113. ISSN: 0975-8151.
26. Shah, K. 2011. Cadmium Metal Detoxification and Hyperaccumulators.- In : Sherameti, I. and Varma, A. (eds.) *Detoxification of Heavy Metals, Soil Biology* 30, Springer-Verlag Berlin Heidelberg, pp. 181-230.
27. Misra, N., Panda, P.K., Shah, K., Sukla, L.B. and Chaubey, P. 2011. Population coverage analysis of T-Cell epitopes of *Neisseria meningitides* serogroup B from Iron acquisition proteins for vaccine design. *Bioinformation* 6(7):255-261.
28. Nahakpam, S. and Shah, K. 2010. Expression of key antioxidant enzymes under combined effect of heat and cadmium toxicity in growing rice seedlings. *Plant Growth and Regulation* 63:23-35. DOI: 10.1007/s10725-010-9508-3
29. Shah, K. and Nahakpam, S. 2010. Heat stress and cadmium toxicity in higher plants- an overview. In : *Advances in Plant Physiology. (Vol XII.)* Ed. Hemantranjan, A; Scientific Publishers (India) Jodhpur, pp. 243-280.
30. Shah, K., Chaubey, P. and Mishra, N. 2010. Bioinformatics approach to the screening and modeling of putative T cell epitopes from Por B protein of *N. meningitides* as vaccine constructs. *Indian Journal of Biotechnology* 9:351-359. ISSN : 0972-5849.
31. Mishra, N., Chaubey, P., Mishra, A. and Shah, K. 2010. Structural Simulation of MHC-peptide Interactions using T-cell epitopes in Iron-Acquisition Protein of *N. meningitidis* for Vaccine Design. *Journal of Proteins and Proteomics* 1:53-63. ISSN: 0975-8151.

32. Nahakpam, S. and Shah, K. 2009. Peroxidase obtained from rice seedlings growing under Cd stress exhibit high affinity for calcium ions. In: *Molecular and Physiological Aspects of Toxicology* Ed. Shah, K. Rainbow Publishers, India, Varanasi, pp. 82-87. ISBN 81-85403-09-2.
33. Raghuvanshi, R. and Shah, K. 2008. Mycorrhizal Technology in Sustainable Development of Stressed Ecosystems. In: *Advances in Plant Physiology (Vol. 10)* Ed. Hemantranjan, A., Scientific Publishers (India) Jodhpur, pp. 441-453. ISSN : 0972-9917
34. Sudha, J. and Shah, K. 2008. Comparative studies on inhibitors of HIV protease-a target for drug design. *In Silico Biology* 8:427-447. <http://www.bioinfo.de.isb/2008/08/0033/main.html>.
35. Nahakpam, S., Singh, P. and Shah, K. 2008. Effect of Calcium on Immobilization of Rice (*Oryza sativa* L.) Peroxidase for Bioassays in Sodium Alginate and Agarose Gel. *Biotechnology and Bioprocess Engineering* 13:632-638.
36. Shah, K. and Appenroth, K.J. 2007. Heavy Metal Stress and Activation of MAP Kinases in rice. In: *Applications of Biotechnology*, Eds. Tripathi, B.N., Shekhawat, G.S., Sharma, V. Aavishkar Publisers, Distributors, Jaipur 302 003 (Raj.) India, pp. 149-166. ISBN : 978-81-7910-215-2.
37. Shah, K. and Nongkynrih, J. 2007. Metal Hyperaccumulators and Bioremediation. *Biologia Plantarum*. 51(4):618-634. (Review)
38. Appenroth, K.J. and Shah, K. 2006. Plants for heavy metal toxicity assessment I. Duckweeds (*Lemnaceae*). In: *Advances in Plant Physiology (Vol. 9)* Ed. Hemantranjan, A., Scientific Publishers (India) Jodhpur, pp. 193-204.
39. Shah, K. and Dubey, R.S. 2005. Plant Metabolism under Temperature Stress. In: *Physiology of Abiotic Stress in Plants*. Eds. Dwivedi, P. and Dwivedi, R.S. Agrobios (India) Publishers, Jodhpur, pp 243-274. ISBN : 81-7754-247-8.
40. Shah, K. 2005. Plant peroxidases –a brief note on response to metal pollutants. In: *Advances in Plant Physiology (Molecular Plant Physiology and Biology, Vol. 8)* Ed. Hemantranjan, A., Scientific Publishers (India) Jodhpur, pp. 113-122.
41. Shah, K., Penel, C., Gagnon, X. and Dunand, C. 2004. Purification and identification of a Ca<sup>2+</sup>-pectate peroxidase from *Arabidopsis* leaves. *Phytochemistry* 65:307-312.
42. Shah, K. and Dubey, R.S. 2003. Environmental stresses and their impact on nitrogen assimilation in higher plants. In: *Advances in Plant Physiology (Vol. 5)* Ed. Hemantranjan, A., Scientific Publishers (India) Jodhpur, pp. 397-431.
43. Shah K., Dunand, C., von Tobel, L. and Penel, C. 2002. Purification and characterization of a pectin binding cationic peroxidase from *Arabidopsis* leaves. In: *Plant Peroxidases: Biochemistry and Physiology*, Eds. Acosta, M., Rodriguez-Lopez, J.N. and Pedreno, M.A. University of Murcia and University of Coruna, Spain, pp. 200-203.
44. Shah, K, Kumar, R.G., Verma, S. and Dubey, R.S. 2001. Effect of cadmium on lipid peroxidation, superoxide anion and activities of antioxidant enzymes in growing rice seedlings. *Plant Science* 161:1135-1144.
45. Kumar, R.G., Shah, K. and Dubey, R.S. 2000. Salinity induced behavioural changes in malate dehydrogenase and glutamate dehydrogenase activities in rice seedlings of differing salt tolerance. *Plant Science* 156:23-34.
46. Shah, K., Sato, K., Kubota, H., Tatsumi, K. and Maitani, T. 1999. Heavy metal caused changes in pigment levels and synthesis of phytochelatin analogs in *Rubia tinctorum* root cultures. In: *Proceedings of 6<sup>th</sup> Annual Meeting of Society of Food Chemistry*, Nagoya, Japan. pp. 26.
47. Shah, K. and Dubey, R.S. 1998. A 18kDa cadmium inducible protein complex : its isolation and characterization from rice (*Oryza sativa* L.) seedlings. *Journal of Plant Physiology* 152:448-454.
48. Shah, K. and Dubey, R.S. 1998. Cadmium elevates the protein level and alters the activity of proteolytic enzymes in germinating rice seeds. *Acta Physiologiae Plantarum* 20:189-196.
49. Shah, K. and Dubey, R.S. 1998. Cadmium suppresses the phosphate level and inhibits the activity of phosphorolytic enzymes in growing rice seedlings. *Journal of Agronomy and Crop Science* 180:223-231.
50. Shah, K. 1998. Polyacrylamide gel electrophoresis a tool for metal stress induced enzymatic changes in rice (*Oryza sativa* L.). In: *Proceedings of the 18<sup>th</sup> Symposium on Capillary Electrophoresis*, Fukuoka, Japan. 73-74.
51. Shah, K. 1997. Radioisotopes gaining ground in research and industry. *The Botanica* (India), 47:96-98.
52. Shah, K. and Dubey, R.S. 1997. Effect of cadmium on proteins, amino acids and protease, aminopeptidase and carboxypeptidase in rice seedlings. *Plant Physiology and Biochemistry* (India). 24 (2):89-95. ISSN : 0019-5502
53. Richharia, A., Shah, K. and Dubey, R.S. 1997. NR purification from rice seeds, its characterisation and the effects of *in situ* and *in vitro* NaCl salinity. *Journal of Plant Physiology* 151:316-322.
54. Shah, K. and Dubey, R.S. 1997. Cadmium alters phosphate level and suppresses activity of phosphorolytic enzymes in germinating rice seeds. *Journal of Agronomy and Crop Science* 179:35-45.
55. Shah, K. and Dubey, R.S. 1997/1998. Effect of cadmium on proline accumulation and RNase activity in rice seedlings: Role of proline as a possible enzyme protectant. *Biologia Plantarum* 40: 121-130.

56. Shah, K. and Dubey, R.S. 1996. Influence of cadmium on proteolytic, nucleolytic and phosphorolytic events in growing rice plants. *Journal of Scientific Research*. 46: 197-198.
57. Shah, K. and Dubey, R.S. 1995. Cadmium induced changes on germination, RNA level and ribonuclease activity in rice seeds. *Plant Physiology and Biochemistry (India)*. 22:101-107. ISSN : 0019-5502.
58. Shah, K. and Dubey, R.S. 1995. Phytochelatins. *The Botanica (India)*. 45:26-27.
59. Shah, K. and Dubey, R.S. 1995. Effect of cadmium on RNA level as well as activity and molecular forms of ribonuclease in growing rice seedlings. *Plant Physiology and Biochemistry* 33:577-584.

#### Articles In Press:

60. Shah K and Singh I. 2015. Unravelling *in silico* the structure and function of hypothetical proteins from rice involved in signaling cross talk between salicylate and jasmonate pathways . In :*Biotechnological Applications for Environmental Protection* Eds. Abhilash P. C. and Singh H. B. Springer-Verlag Berlin Heidelberg. In Press.
61. Singh P and Shah K 2015. An update on effects of nitric oxide under abiotic stresses in higher plants. Vol. 15, *Advances In Plant Physiology*. Ed. Hemantranjan, A. Scientific Publishers (India) Jodhpur, ISSN: 0972-9917; ISBN:978-81-7233. In Press.
62. Shah K, Kumar M, Chand R, 2015. Role of Melanin in the Biology of Spot Blotch Pathogen of Barley and its Management. Vol. 15, *Advances In Plant Physiology*. Ed. Hemantranjan, A. Scientific Publishers (India) Jodhpur ISSN: 0972-9917; ISBN:978-81-7233. In Press.

#### Research Project details

1. **Principal Investigator** for Department of Science and Technology, Govt. Of India, New Delhi funded project under Fast Track Proposal for Young Scientists from July 16, 2003-2007. Entitled, "*Purification, characterization and possible functions of isoperoxidases in cell wall of rice seedlings growing under heat injury and heavy metal stress.* Rs 4.18 lakhs
2. Co-PI for Department of Biotechnology, Govt. of India, New Delhi funded project entitled, "*Identification of and characterization of novel genetic and molecular mechanisms behind arsenic tolerance using Brassica juncea as model system*"-3 yrs from 04-05-2010, Rs. 11.71 Lakhs.
3. DST funded project for 3 yrs entitled "*Effect of nitric oxide, salicylic acid and jasmonic acid on alleviation of metal induced oxidative burst in rice*" awarded to Ms Indra Singh under Women Scientist Scheme –A(WOS-A) for Rs.11.00 lakhs is being carried out under guidance of Dr.Kavita Shah.
4. PI for DST funded project entitled "*Immobilized rice-peroxidase biosensor for dopamine determination based on functionalized conducting polymers.*"2 yrs, Rs.18 lakhs from Sept 2010 to Dec 2013.
5. PI for UGC –funded project entitled, "*Influence of nitric oxide and salicylic acid signaling on cadmium –stress-induced oxidative burst and protein profile in rice.*"3 yrs Rs.6.38 lakhs from Feb 2011 to Feb 2013.
6. Co-PI for CSIR funded project entitled, "Design, synthesis, characterization, optimization and evaluation of water compatible molecularly imprinted polymeric (MIP) sensors for selective protein capture by epitope imprinting" 3 yrs Rs 21.00 lakhs from April 2013 onwards.

#### Conferences/Seminars/Symposia/Workshops attended:

Papers in 50 National and International Conferences held in India and Abroad.



**National Conferences (within India):**

<b>S. No.</b>	<b>Title of Paper</b>	<b>Author/Co-Author</b>	<b>Name of Conference</b>	<b>Place</b>	<b>Date and Year</b>
1	Effect of cadmium toxicity on ribonuclease activity and its isoforms in growing rice plants.	Shah, K and Dubey, R.S.	81 <sup>st</sup> Session of Indian Science Congress	Jaipur	January 3-7, 1994
2	Cadmium toxicity effects on nucleolytic and proteolytic activities in growing rice plants.	Shah, K. and Dubey R.S.	31 <sup>st</sup> Annual Convention of Chemists	Varanasi	December 1994
3	Absorption and distribution of cadmium in growing rice plants and isolation of an inducible 18kDa cadmium binding protein complex from root tissues.	Shah, K. and Dubey R.S.	4 <sup>th</sup> Convention of the Indian Society of Agricultural Biochemists	Varanasi	March 20-21, 1995
4	Cadmium accumulation and distribution in relation to proline level in rice plants.	Shah, K. and Dubey R.S.	64 <sup>th</sup> Annual Meeting of Society of Biological Chemists (India)	Lucknow	October 16-18, 1995
5	Cadmium toxicity in rice plants. Absorption and distribution of cadmium as well as isolation of an inducible protein complex from rice seedlings.	Shah, K.	83 <sup>rd</sup> Session of Indian Science Congress	Patiala	January 3-7, 1996
6	Cadmium induced changes in ribonuclease isoforms in rice seedlings and role of proline as enzyme protectant	Shah, K., Kumar, R.G. and Dubey R.S.	National Symposia on Modern Perspectives in Biochemistry and Biotechnology	Lucknow	October 25-27, 1996
7	Absorption and distribution of cadmium in growing rice plants and the role of osmolytes in stress tolerance	Shah, K. and Dubey R.S.	National Seminar on Conservation of Endangered Species and Ecosystems	Varanasi	December 5-7, 1996
8	Effect of cadmium toxicity on phosphorolytic events in germinating rice seeds	Shah, K. and Dubey R.S.	84 <sup>th</sup> Session of Indian Science Congress	New Delhi	January 3-7, 1997
9	The changes in behaviour of phosphorolytic enzymes from rice as affected by heavy metal cadmium.	Shah, K.	66 <sup>th</sup> Annual Meeting of Society of Biological Chemists (I)	New Delhi	October, 1997
10	Water stress induced alterations in behaviour of nitrogen assimilatory enzymes and malate dehydrogenase isoforms in growing rice plants	Shah K and Dubey R.S.	90 <sup>th</sup> Session of Indian Science Congress	Bangalore	January 3-7, 2003
11	Effect of cadmium on germination and seedling vigour of susceptible and tolerant rice ( <i>Oryza sativa</i> ) cultivars from North-East – a preliminary study	Nahakpam S. and Shah K.	Symposium on Advances in Biochemical Education and Research	Department of Biochemistry, Shillong, Meghalaya	February 25-26, 2005

12	Member of the Academic Program Committee and Reports Committee	Shah K.	National Seminar and workshop on Bioinformatics and Computational Biology	MMV, Banaras Hindu University, Varanasi	March 22-24, 2006
13	Tools and Biotechnological Approaches on Seed Quality Evaluation <b>(Invited Lecture)</b>	Shah K.	National Training on Seed Quality Control and Seed Testing	National Seed Research and Training Centre, Ministry of Agriculture, Govt. of India, Varanasi	March 19-23, 2007
14	<i>In situ</i> localization of heavy metal cadmium and histochemical staining of peroxidase in growing rice seedlings	Nahakpam S. and Shah K	77 <sup>th</sup> Annual Session of National Academy of Sciences, India and Symposium on Novel Approaches for Food and Nutritional Security	Central Food and Technological Research Centre, Mysore	December 6-8, 2007
15	Evaluation of Seed Quality: Biochemical and Biotechnological Techniques <b>(Invited Lecture)</b>	Shah K.	National Training on Seed Quality Regulation and Seed Health Testing and Varietal Identification through in vitro techniques	National Seed Research and Training Centre, Ministry of Agriculture, Govt. of India, Varanasi	February 18-22, 2008
16	Calcium helps in binding of enzyme peroxidase from shoots of growing rice plants	Nahakpam S. and Shah K	National Symposium on Recent Advances in Toxicological Studies: Molecular and Physiological Aspects	Mahila Mahavidyalaya, Banaras Hindu University, Varanasi	February 27-28, 2008
17	Metabolomics: From Biochemistry to System Biology <b>(Invited Lecture)</b>	Shah K	National Seminar and Workshop on Metabolic Networks and Drug Designing	Mahila Mahavidyalaya, Banaras Hindu University, Varanasi	November 28-30, 2008
18	Purification of cationic peroxidase from rice and its potential use in biosensor	Shah K and Nahakpam S	96 <sup>th</sup> Session of Indian Science Congress	North Eastern Hill University, Shillong	January 3-7, 2009
19	Structural Simulation of Putative T-cell epitopes for designing of Meningitis vaccine	Chaubey P, Shah K and Singh P	National Seminar on Bioinformatics: Approaches and Applications in Biosciences	Mahila Mahavidyalaya, Banaras Hindu University, Varanasi	March 5-6, 2009
20	Development of Transgenic Tomato (var. Kashi vishesh) lines using BCZAT12 gene for abiotic stress resistance	Rai A.C., Singh M., Shah K, Kumar S and Rai M	6 <sup>th</sup> Solanaceae Genome Workshop SOL 2009	Le Meridien, New Delhi, India	November 08-13, 2009

21	Plant bioinformatics: a cross-talk between wet-lab and computational tools <b>(Invited Talk)</b>	Shah K	Winter school	Indian Institute of Vegetable Research, Varanasi	December 01-17, 2009
22	Plant bioinformatics and study of seeds <b>(Invited Talk)</b>	Shah K	National Training on Integrated Seed Improvement	National Seed Research and Training Centre, Ministry of Agriculture, Govt. of India, Varanasi	February 01-10, 2010
23	Sahitya aur Sanskriti : Bazar ka Hastakshep.	Shah K	National Seminar on Global Challenges : Literature, Culture, Society , and Environment.	MMV, BHU	March 19-20,2010
24	Mahapurano me varnit pavitra vriksh evam vartaman me carbon credit	Rai Dr.J.S. Shah K	National Seminar on Global Challenges : Literature, Culture, Society, and Environment.	MMV, BHU	March 19-20,2010
25	GM Seeds from India: Laboratory techniques to assess transgenes in seeds <b>(Invited Talk)</b>	Shah K	National Training on Seed Quality Regulation and Seed Testing	National Seed Research and Training Centre, Ministry of Agriculture, Govt. of India, Varanasi	July 26-30, 2010
26	Expression pattern of SOD isoforms and stress-induced proteins under combined effect of cadmium and heat stress into two rice genotypes.	Nahakpam S, Shah K	National conference of Plant Physiology on Physiological and Molecular Approaches for Crop Improvement under Changing Environment	Institute of Agricultural Sciences, BHU Varanasi	November 25-27,2010
27	Transcriptional Response of the artemisinin biosynthesis to sodium acetate elicitation in <i>Artemisia annua</i> hairy root culture.	Rai S.P., Meena R.P., Shah K and Rai S.K.	National conference of Plant Physiology on Physiological and Molecular Approaches for Crop Improvement under Changing Environment	BHU Varanasi	November 25-27,2010

28	Youth of India during pre-independence era and Mahamana's vision	Shah K and Swarnlata	National Seminar on Mahamana's Vision and the Challenges of The Millenium Development Goals	MMV, BHU Varanasi	March 01-02,2011
29	Crosstalk between salicylate and jasmonate pathways in <i>Oryza sativa</i> -an in silico study	Agrawal P, Singh N, Singh I, Singh P and Shah K	National Symposium on Emerging Trends In Plant Sciences	Centre of Advanced Study, Department of Botany, BHU Varanasi	March 03-04, 2011
30	Climate Change- A Potential Trigger for Psoriasis	Arora N, Pandey N, Meena RP, Shah K and Rai SP	National Workshop on Role of Higher Education in Disaster Management In India : Issues and Challenges	Institute of Enviro. and Sustainable Develop., BHU Varanasi	April 29-30, 2011
31	Management of Metal Contaminated Sites Employing Green Mops	Shah K, Nahakpam S and Singh P	National Workshop on Role of Higher Education in Disaster Management In India : Issues and Challenges	Institute of Enviro. and Sustainable Develop., BHU Varanasi	April 29-30, 2011
32	Understanding Biochemical and Molecular Biology Techniques in Seed Science  <b>(Invited Talk)</b>	Shah K	National Training on Seed Testing	National Seed Research and Training Centre, Ministry of Agriculture, Govt. of India, Varanasi	September 26-30, 2011
33	Application of Biotechnology tools for testing seed quality and GM crops  <b>(Invited Talk)</b>	Shah K	National Training on Seed Testing	National Seed Research and Training Centre, Ministry of Agriculture, Govt. of India, Varanasi	September 26-30, 2011

34	Bioinformatics for Entrepreneurs  <b>(Invited Talk)</b>	Shah K	Technology Incubation Cell, IT, BHU	Institute of Technology, BHU	October 13, 2011
35	Rain Water Harvesting	Shah K	4 <sup>th</sup> Refresher Course in Environmental Studies	UGC-Academic Staff College, Banaras Hindu University, Varanasi	October 01-21, 2011
36	In silico study of interaction of PAD4 with EDS1 a regulator of salicylic acid signaling pathway	Singh I and Shah K	Conference on “Nucleic Acids in Disease and Disorder”	IIT Delhi, New Delhi	December 7-9, 2011
37	Role of salicylic acid and jasmonic acid as signal molecule in plant defense to cadmium stress	Singh I and Shah K	National Seminar on Reactive Oxygen Species: Roles in animal and plant biology	Department of Biochemistry, University of Lucknow, Lucknow	December 23-24, 2011
38	Sodium nitroprusside treatment mitigates the effect of Cadmium stress in growing rice seedlings	Singh Purna and Shah K	National Seminar on Reactive Oxygen Species: Roles in animal and plant biology	Department of Biochemistry, University of Lucknow, Lucknow	December 23-24, 2011
39	Studies with rice peroxidase for potential application in development of hydrogen peroxide sensor	Singh Priyanka and Shah K	National Seminar on Reactive Oxygen Species: Roles in animal and plant biology	Department of Biochemistry, University of Lucknow, Lucknow	December 23-24, 2011

40	Data mining for structural template analogues to saquinavir and HIV protease inhibitor for anti retroviral drug design	Jayaswal A and Shah K	99th Indian Science Congress	KIIT University, Bhubaneswar	January 3-7, 2012
41	Salicylic acid signaling in plants under stress: environmental issue for sustainable crop management  (Invited Lecture)	Singh I and Shah K	99th Indian Science Congress	KIIT University, Bhubaneswar	January 3-7, 2012
42	Scope and Applications of Bioinformatics  (Invited Lecture)	Shah K	Training and Refresher Course	Indian Institute of Vegetable Research, Varanasi	March 06, 2012
43	Scope of Bioinformatics and its applications  (Invited Lecture)	Shah K	Workshop on Applications of Biotechnology and Related Tools	Department of Biotechnology, Agrasen P. G. College, Varanasi	April 07 2012
44	Structural analogs of elvitegravir have potential as an inhibitor of HIV-integrase	Shah K and Jayaswal A	NASI Annual meet	Institute of Oceanography and University of Goa, Goa	Nov 6-10, Goa 2013
45	Structure and function prediction of stress-responsive C2H2-type-Zinc finger protein-BcZAT12 that confers abiotic stress tolerance in transgenic tomato plants	Shah Kavita, Rai Avinash Chandra, Singh Indra, Singh Major	National Symposium on Abiotic stress and transcription factor	Indian Institute of Vegetable Research, Varanasi	Dec 2013

**International Conferences (in India and Abroad):**

<b>S. No.</b>	<b>Title of Paper</b>	<b>Author/Co-Author</b>	<b>Name of Conference</b>	<b>Place</b>	<b>Date and Year</b>
42	Uptake and distribution of cadmium in growing rice plants and isolation of a 18kDa cadmium inducible protein complex.	Shah, K and Dubey, R.S..	2 <sup>nd</sup> International Crop Science Congress	New Delhi, <b>INDIA</b>	November 18-21, 1996
43	Polyacrylamide gel electrophoresis a tool for metal stress induced enzymatic changes in rice ( <i>Oryza sativa</i> L.)	Shah, K.	18 <sup>th</sup> Symposium on Capillary Electrophoresis	Fukuoka, <b>JAPAN</b>	December 18-21, 1998
44	Heavy metal caused changes in pigment levels and synthesis of phytochelatin analogs in <i>Rubia tinctorum</i> root cultures.	Shah K., Sato K, Kubota H., Tatsumi K. and Maitani T.	6 <sup>th</sup> Annual Meeting of Society of Food Chemistry	Nagoya, <b>JAPAN</b>	March 3-4, 1999
45	Induction of iso-PC(Gln) catalyzed by a unique gamma-glutamyl transpeptidase and its utilization for PC synthesis in cadmium treated root cultures of <i>Armoracia rusticana</i> ..	Shah, K. Kubota, H., Yamada, T. and Maitani, T.	Plant Biology Canada'99	Saskatoon, <b>CANADA</b>	January 19-23, 1999
46	Cadmium induced suppression in the activities of key metabolic enzymes and induction of stress-specific proteins in growing rice ( <i>Oryza sativa</i> L.) plants.  "Young Scientist Award Forum"	Shah, K. and Dubey R.S.	18 <sup>th</sup> International Union of Biochemistry and Molecular Biology Congress	Birmingham, <b>UNITED KINGDOM</b>	July 13-20, 2000
47	Purification and characterization of a pectin binding cationic peroxidase from <i>Arabidopsis</i> leaves.	Shah K., Dunand C., von Tobel L. and Penel C.	VI International Plant Peroxidase Symposium	Murcia, <b>SPAIN</b>	July 3-7, 2002
48	Histochemical localization of guaiacol peroxidase and cadmium in roots of susceptible and tolerant rice cultivars from North-East India	Nahakpam S and Shah K	VII International Peroxidase Symposium	Fukuoka, <b>JAPAN</b>	September 11-15, 2005
49	Changing patterns of enzyme ascorbate peroxidase and glutathione reductase isoforms under combined effect of cadmium and heat stress	Nahakpam S. and Shah K	International Conference on Role of Biomolecules in Food Security and Health Improvement and XI Silver Jubilee Convention of Indian Society of Agricultural Biochemists	Department of Biochemistry Faculty of Science, Banaras Hindu University, Varanasi <b>INDIA</b>	February 17-20, 2010
50	HIV Protease Inhibitor as Target for Drug Design	Shah K	BIT'S Inaugurate Symposium on Enzymes and Biocatalysis (SEB 2010)	Shanghai, <b>CHINA</b>	April 22-24, 2010

**Extra-curricular Activities :**

1. Published articles in several Newsletter and Scientific reports namely in
  - (a) Communication, JISTEC Newsletter, Japan
  - (b) STA Today, Official Governmental Science magazine from Japan Science and Technology, Japan.
2. A Children program-Science forum radio talker at All India Radio, Varanasi, India.
3. Holds training as a Girl Guide and N.C.C. Cadet.
4. Worked as a member of the organizing committee in organizing the **Fourth Convention of Agricultural Biochemists and symposium on recent developments in Biochemistry** hosted by Department of Biochemistry, Faculty of Science, Banaras Hindu University, India.
5. Worked as a member of the organizing committee in organizing the **Silver Jubilee Seminar on Advances in Biochemical Education and Research** hosted by Department of Biochemistry, North-Eastern Hill University, Shillong, India.
6. Diploma in Indian Instrumental Music, the Sitar.
7. Associated with Science, Craft and Flower arrangements.
8. Comparer at functions and several social events of various kinds.
9. A Member of the Academic Program Committee and Reports Committee for **National Seminar and workshop on Bioinformatics and Computational Biology** held at MMV, Banaras Hindu University, Varanasi, during March 22-24, 2006.
10. Associated with various bodies at Varanasi like Kala Prakash, Rotary International, Bharat Vikas Parsihad, JC, etc.
11. Active participation at games and sport. Won 2<sup>nd</sup> prize for 100m race at BHU teachers sports meet.
12. Invited Speaker at Vanita Polytechnic, Varanasi for a Lecture cum demonstration on “Flower Decoration and Interiors” held on 08.09.2010.
13. Invited Speaker at Institute of Chartered Accountants, Varanasi, Chapter on “Management of Meetings” and “General Management and Communication Skills” held during 24<sup>th</sup> Jan 06 to 8<sup>th</sup> Feb 2006 and 27<sup>th</sup> Feb 2007 to 16<sup>th</sup> March 2007.

(Kavita Shah)