

## **DEVESH SHUKLA**

Post Doctoral Research Associate

Department of Biology

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**Google Scholar:** <http://scholar.google.co.in/citations?user=v2ZG2sEAAAAJ&hl=en>

**Research Gate:** [http://www.researchgate.net/profile/Devesh\\_Shukla](http://www.researchgate.net/profile/Devesh_Shukla)

### **Personal details**

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**Date of birth -** 22<sup>nd</sup> April, 1983

**Gender -** Male

**Area of Interest -** Plant Biotechnology, Functional Genomics, Plant-Metal Interaction

### **Education**

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**Doctoral**                    **Ph.D. in Biochemistry (2012)**, University of Lucknow, Lucknow and CSIR-NBRI Lucknow India. Thesis Title: **“Development of transgenic tobacco plants overexpressing phytochelatin synthase gene for phytoremediation of heavy metals”**

**Postgraduation**        M.S., Biotechnology (2005, First div.) C.S.J.M. University, Kanpur, India.  
M.S. dissertation title “Genotoxicity assessment of pesticide dichlorvos in fresh water fish *Mystus vittatus* (Bloch) using comet assay.” (Plz. See related article in publication list)

**Graduation**            B.S. Majors: Botany, Chemistry (2003, First div.), K.K. P.G. College Etawah, C.S.J.M. University, Kanpur, India

### **Fellowships, Award and Current Position**

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1. Worked as Project Assistant since October, 2005 to September, 2008 at CSIR-N.B.R.I.
2. Senior Research Fellowship (Fellowship for pursuing Ph.D.) awarded by Council of Scientific and Industrial Research, India from October, 2008 to September 2011.
3. Worked as Research Associate at Plant Molecular Biology group, ICGEB, New Delhi, from May 2012 to July 2013.
4. Selected as a 2016 PlantingScience Fellow under the digging deeper PlantingScience program sponsored by Botanical Society of America.
5. At present, have been working on research projects, 1. In-planta synthesis of gold nanoparticles: An Integrative Eco-friendly “Green Engineering” Approach; funded by NSF, 2. “Application of biotechnological tools to generate plants in order to remove excess phosphorus from contaminated sites” funded by USDA; since August 2013 at Department of Biology, Western Kentucky University, Bowling Green, Kentucky, U.S.A.

### **Professional Competences and Skill Acquired**

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**(A) DNA**

1. Extensive experience with recombinant DNA technology (**Shukla et al., 2012; 2013 a, b; 2014**).
2. Preparation of SMART cDNA library and Genomic DNA library and isolation of full-length cDNAs by 5' and 3' RACE and by genome walking (**Shukla et al., 2012**).
3. Designing of constructs, cloning and expression of reporter genes in plant cells.
4. Southern blotting and hybridization.
5. Designing and synthesis of artificial genes (**Shukla et al., 2013**).

**(B) RNA**

1. Northern blotting and hybridization, Microarray hybridization using Affymetrix gene chip technology (**Chakrabarti et al., 2009 a, b; Shukla et al., 2014**), Semiquantitative and quantitative Real-Time PCR (**Shukla et al., 2012; 2013 a, b; 2014; Yadav et al., 2013; Shukla et al., 2014**).

**(C) Protein**

1. SDS PAGE and Native PAGE in-gel enzymatic assays (**Shukla et al., 2013; Shree et al., 2009**).
2. Heterologous expression of protein in *E.coli* and measurement of enzymatic activity (**Shukla et al., 2013**).

**(D) Phytochemistry**

1. HPLC analysis of non protein thiolic compounds and their derivative such as phytochelatins (**Shukla et al., 2012; 2013**).

**(E) Transgenics and tissue culture**

1. Functional analysis of genes by using Tobacco and *Arabidopsis* as a model plant (**Shukla et al., 2012; 2013 a, b**).
2. Transformation of tobacco and *Arabidopsis* plants through biolistic and *Agrobacterium* mediated methods (**Shukla et al., 2012; 2013 a, b**).

**(F) Genotoxicity**

1. Assessment of DNA damage due to exposure of different xenobiotics using “Comet assay” (**Shukla et al., 2010**).

**(G) Morphometric analysis**

1. Mapping of traits of root system architecture (RSA) using image-J program.
2. Analysis and measurement of shoot area using image-J program.

**(H) Subcellular localization**

1. Transient subcellular localization of sGFP-fusion protein on onion peel (Yadav et al. 2014).

**(I) Computers**

1. Windows 7 and MS Office, Coral draw, Adobe Photoshop.

**(J) Bioinformatics**

1. Online database mining, sequence alignment and manipulation. Microarray data analysis (**Chakrabarti et al., 2009 a, b; Shukla et al., 2014**).

**Publication**

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1. Tiwari M, Krishnamurthy S, **Shukla D**, Kiiskila J, Jain A, Datta, R, Sharma N, Sahi S (2016) Comparative transcriptome and proteome analysis to reveal the

- biosynthesis of gold nanoparticles in Arabidopsis. **Scientific Reports**. 23;6:21733. doi: 10.1038/srep21733.
2. **Shukla D**, Krishnamurthy S, Sahi, SV. (2015). Microarray analysis of Arabidopsis under gold exposure to identify putative genes involved in the synthesis of gold nanoparticles (AuNPs). **Genomics Data** 3: 100-102.
  3. **Shukla D**, Krishnamurthy S, Sahi SV. (2014) Genome wide transcriptome analysis reveals ABA mediated response in Arabidopsis during gold (AuCl<sub>4</sub><sup>-</sup>) treatment. **Frontiers in Plant Science** 5:00652 doi: 10.3389/fpls.2014.00652.
  4. **Shukla D**, Huda KM, Banu MS, Gill SS, Tuteja R, Tuteja N. (2014) OsACA6, a P-type 2B Ca<sup>2+</sup> ATPase functions in cadmium stress tolerance in tobacco by reducing the oxidative stress load. **Planta** 240: 809-824.
  5. Shri M, Dave R, Diwedi S, **Shukla D**, Kesari R, Tripathi RD, Trivedi PK, Chakrabarty D. (2014) Heterologous expression of *Ceratophyllum demersum* phytochelatin synthase, CdPCS1, in rice leads to lower arsenic accumulation in grain. **Scientific Reports** 4:5784. doi: 10.1038/srep05784.
  6. Yadav D, **Shukla D**, Tuteja N. (2014). Isolation, in silico characterization, localization and expression analysis of abiotic stress-responsive rice G-protein beta subunit (RGB1). **Plant Signaling & Behavior** 2014;9:e28890. PMID:24739238.
  7. **Shukla D**, Kesari R, Tiwari M, Dwivedi S, Tripathi R.D, Nath P, Trivedi P.K. (2013b) Expression of *Ceratophyllum demersum* phytochelatin synthase, CdPCS1, in *Escherichia coli* and Arabidopsis enhances heavy metal(loid)s accumulation **Protoplasma** 250: 1263-1272.
  8. **Shukla D**, Tiwari M, Tripathi R.D, Nath P, Trivedi P.K. (2013a) Synthetic phytochelatin complement a phytochelatin-deficient Arabidopsis mutant and enhance the accumulation of heavy metal(loid)s. **Biochemical Biophysical Research Communications** 434: 664-669.
  9. Yadav D, **Shukla D**, Tuteja N. (2013) Rice heterotrimeric G-proteins alpha subunit (RGA1): in silico analysis of the gene and promoter and its up-regulation in abiotic stress. **Plant Physiology and Biochemistry** 63: 265-271.
  10. **Shukla D**, Kesari R, Mishra S, Diwedi S, Tripathi R.D, Nath P, Trivedi P.K. (2012) Expression of phytochelatin synthase from aquatic macrophyte *Ceratophyllum demersum* L. enhances cadmium and arsenic accumulation in tobacco. **Plant Cell Reports** 31: 1687-1699.
  11. Chakrabarty D, Trivedi P.K, Mishra P, Tiwari M, Shri M, **Shukla D**, Kumar S, Rai A, Pandey A, Nigam D, Tripathi R.D, Tuli R. (2009). Comparative transcriptome analysis of arsenate and arsenite stresses in rice seedlings. **Chemosphere** 74: 688-702.
  12. Chakrabarty D, Trivedi P.K, Shri M, Mishra P, Asif M.H, Dubey S, Kumar S, Rai A, Tiwari M, **Shukla D**, Pandey A, Nigam D, Tuli R. (2009) Differential transcriptional expression following thidiazuron induced callus differentiation developmental shifts in rice. **Plant Biology** 12: 46-59.
  13. Shri M, Kumar S, Chakrabarty D, Trivedi P.K, Mallick S, Mishra P, **Shukla D**, Mishra S, Srivastava S, Tripathi R.D, Tuli R. (2009) Effect of arsenic on growth, oxidative

stress and antioxidant system in rice seedlings. **Ecotoxicology and Environmental Safety** 72: 1102-1110.

14. **Shukla D**, Nagure N.S, Kumar R, Singh P.J (2010) Assessment of genotoxicity of dichlorvos to *Mystus vittatus* (Bloch) by comet assay. **Indian Journal of Fisheries** 57: 39-44.

### **Book Chapter**

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1. **Shukla D**, Trivedi P.K, Nath P and Tuteja, N (2016) Metallothioneins and Phytochelatins: Role and Perspectives in Heavy Metal(loid)s Stress Tolerance in Crop Plants, in *Abiotic Stress Response in Plants* (eds N. Tuteja and S. S. Gill), Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany. doi: 10.1002/9783527694570.ch12

### **Manuscript under communication**

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1. **Shukla D**, Rinehart C, Sahi S. (2016) Comprehensive Study of Excess Phosphate Response (EP<sub>i</sub>R) reveals induction of Ethylene Mediated Signaling that Negatively Regulates Plant Growth.

### **Recent conferences Attended**

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1. **Shukla D.**, Rinehart C.A., Sahi S.V., (2015) “A comparative study of plant responses under excess or deficient phosphate (P<sub>i</sub>) regime reveals novel ethylene responsive players involved in excess phosphate response (EP<sub>i</sub>R) phenotype” In; **Plant Biology 2015 (PB-15)** Organised by **American Society of Plant Biologist** at Minneapolis, Minnesota (USA) July 26-30, 2015 (**Poster presentation**).
2. **Shukla D.**, Rinehart C.A., Sahi S.V., (2015) “Identification and characterization of molecular and morphophysiological responses under excess phosphate in *Arabidopsis*” In; **Fifth International conference on plants and Environmental pollution (ICPEP-5)** Organised by International society of Environmental Botanists and CSIR-N.B.R.I. Lucknow (India) December 24-28, 2015 (**Oral presentation**).
3. **Shukla D.**, Tiwari M., Tripathi R.D., Nath P and Trivedi P.K., (2011) Designing of artificial genes for synthetic phytochelatins (ECs) and their use in developing transgenic plants for phytoremediation. In: **80<sup>th</sup> Annual Meeting of the Society of Biological Chemists (India): Metabolic Pathway Modulations-Applications in Health and Agriculture**. Organised by CSIR-C.I.M.A.P. Lucknow (India), November 12-15, 2011.

### **Professional and Community Services**

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*Referee for the peer reviewed journals*

2014-	Functional Integrated Genomics (Springer)
2014-	Plant Physiology and Biochemistry (Elsevier)
2014-	Plos One (Plos)
2015-	Environmental Monitoring and Assessment (Springer)
2016-	Frontiers in Plant Science (Frontiers)

### *External Examiner for Doctoral Thesis*

2014- Doctoral Thesis Examiner for Faculty of Science, SMVD University, Katra (J&K), India.

### *Judge*

2015- Judged an annual debate tournament (Lincoln-Douglas Debate) at WKU, Bowling Green, KY, USA.

2016 Served as a moderator for a poster session in 46<sup>th</sup> Annual Student Research Conference at WKU, Bowling Green, KY, USA.

### *Plant Science Mentor*

2015- Mentoring the college students to design and conduct the experiments and analysing the results under Master Plant Science Team (MPST) program organised by PlantingScience Botanical Society of America and American Society of Plant Biology.

### **Workshop attended**

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- “PlantingScience: Digging Deeper Summer Professional Development (DD-SPD)” held at BSCS, Colorado Spring, CO, U.S.A. organised by Botanical Society of America, July 10 - July 13 2016.
- “Standing up for science workshop: Plant Genetics & Biotechnology” held at convention centre, Minneapolis, Minnesota, U.S.A. organized by American Society of Plant Biologist during Plant Biology 2015 meeting, July 30<sup>th</sup> 2015.
- “Regulation of Genetically Engineered Plants in the US – What developers and Academics need to know” held at convention centre, Minneapolis, Minnesota, U.S.A. organized by American Society of Plant Biologist during Plant Biology 2015 meeting, July 28<sup>th</sup> 2015.
- “USDA, DOE and NSF Grantsmanship Workshop” held at convention centre, Minneapolis, Minnesota, U.S.A. organized by American Society of Plant Biologist during Plant Biology 2015 meeting, July 27<sup>th</sup> 2015.
- “Rethinking Biotech Literacy and Communication” held at convention centre, Minneapolis, Minnesota, U.S.A. organized by American Society of Plant Biologist during Plant Biology 2015 meeting, July 26<sup>th</sup> 2015.
- “Bioinformatics Resources for Plant biology Research” held at convention centre, Minneapolis, Minnesota, U.S.A. organized by American Society of Plant Biologist during Plant Biology 2015 meeting, July 26<sup>th</sup> 2015.
- A short term training programme on “Bioinformatics: Tools, Techniques and Application” held at Bioinformatics Infrastructure Facility (BIF), Centre of Excellence in Bioinformatics (COEBI), Department of Biochemistry, University of Lucknow, Lucknow (India), February 11-12, 2012.

### **Memberships in Professional Organisations**

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1. Member of American Society of Plant Biologists, United States of America.
2. Member of Kentucky Academy of Science, United States of America.
3. Life member of “The Society of Biological Chemists”, India.
4. Member of Alumni Association of Dept. of Biochemistry, University of Lucknow, Lucknow, India.

### **Extracurricular activities**

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- Participated in the SSBMT cricket tournament as a member of team NBRI held at CLRI, Chennai, India in the year of 2009.
- Exploring Science of the Inner Space.

### **Future Goals**

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To be part of a modern and dynamic organization that constantly seeks to grow and diversify, and wish to contribute in growth of the organization by pursuing quality research, teaching and training/the manpower/human resource.