

Dr. Ashutosh K. Shukla

Senior Principal Scientist
Biotechnology Division
CSIR-Central Institute of Medicinal and Aromatic Plants
P.O. CIMAP, Lucknow 226015, U.P., India
Telephone (o): +91-522-2718553
Cell: +91-9450932113
Email: ashutoshshukla@cimap.res.in; ashupov@yahoo.com



Area of Specialization

Dr. Ashutosh K. Shukla's core research area is medicinal plant molecular biology and biotechnology with a focus on alkaloid-producing plants. His lab aims to make a meaningful contribution towards better understanding of various aspects of secondary metabolism in medicinal plants. He has carried out studies on biotic/abiotic modulation of plant secondary metabolism and also contributed in medicinal plant authentication and validation of traditional claims on medicinal properties of plants. His work has provided new insights for omics-based characterization of secondary metabolism in contrasting organs, genotypes and developmental stages of medicinal plants like *Catharanthus roseus*, *Papaver somniferum* and *Artemisia annua*. A major thrust area of the lab is focused on evolving vindoline enhancing strategies and carrying out relevant gene prospecting in *C. roseus*. It involves elucidation of stress and micronutrient dependency of vindoline accumulation in *C. roseus*. Analysis/characterization of genes responsible for modulating high-value medicinally-important secondary metabolite biosynthesis is expected to facilitate cost-effective production alternatives. Further, the lab is using biotechnology for validation of Ayurveda and providing a scientific basis for principles of traditional medicine. Special interest lies in gaining insights into hypoglycemic/antidiabetic, anti-allergic, hepatoprotective and IBD-managing potential of medicinal plants. The lab is also venturing to study the biosynthesis of economically important alkaloids in some unexplored Indian medicinal plants.

Education

B.Sc. (Physics, Chemistry & Mathematics) – University of Lucknow, 1994, Position in university merit list

M.Sc. (Biochemistry) - University of Lucknow, 1996, Gold Medal for First Position in Order of Merit

M.B.A. (Marketing) - University of Lucknow, 1998

Ph.D. (Biochemistry) - University of Lucknow, 2005 (Submitted), 2007 (Awarded)

Title of PhD thesis - "Molecular studies on biosynthesis of shoot alkaloids in *Catharanthus roseus* (L.) G Don"

Supervisors - Dr. Suman P.S. Khanuja, Former Director, CSIR-Central Institute of Medicinal and Aromatic Plants, Lucknow & Prof. Prakash C. Misra, Former Head, Department of Biochemistry, University of Lucknow, Lucknow

Post-Doctoral

Visiting Scientist and IUSSTF Research Fellow - Donald Danforth Plant Science Center, St. Louis, Missouri, USA, September 2012 to September 2013

Title of Project - "Identification and characterization of candidate genes towards filling in the gaps present in the biosynthetic pathways of therapeutically useful plant alkaloids"

Host Supervisor - Prof. Dr. Toni M. Kutchan

Visiting Scientist and Raman Research Fellow - Institute of Pharmaceutical Sciences, Albert-Ludwigs-University Freiburg, Germany, March 2018 to June 2018

Title of Project - "Biomimicking medicinal plant-derived enzymes and using microbes towards production of value-added phytochemicals"

Host Supervisor - Prof. Dr. Michael Müller

Countries visited: USA, Germany, France, and Switzerland

Academic scholarships and awards

1. **Topped the school** (St. Mary's High School, Lucknow) in ICSE (1989).
2. **National Scholarship Award** - 1994 from Ministry of Human Resource Development, Department of Education, Government of India, New Delhi on the basis of merit position in the B.Sc. examination of 1994 conducted by the University of Lucknow.
3. **Rai Saheb Sheo Shanker Memorial Scholarship** for securing highest marks and first position in M.Sc. I (Biochemistry) examination conducted by the University of Lucknow, Lucknow in 1995.
4. **Prof. P.S. Krishnan Gold Medal** for securing first position in order of merit in the M.Sc. (Biochemistry) examination conducted by the University of Lucknow, Lucknow in 1996.
5. **BioTalent Award - First prize at the Bangalore Bio 2007** Poster Session – *Walkway of Discovery* (7th to 9th June, 2007).
6. **First prize in the Science and Innovation Quiz organized by UK Trade and Investment at Bangalore Bio 2007**, which also found a mention in the June-July, 2007 issue of *Britain Today*.
7. **CIMAP Day Award 2007** in recognition of contribution towards enabling CIMAP to achieve the Biotalent Award at Bangalore Bio 2007 – *Walkway of Discovery*.

8. **Award for the Highest Impact Factor Publication of CIMAP during 2006-07** on the occasion of CIMAP Day (11 August 2007).
9. **BioTalent Award at the Bangalore Bio 2008** Poster Session – *Walkway of Discovery* (24th to 26th April, 2008).
10. **Best Research Paper Award 2007** given by the Alumni Association of the Department of Biochemistry (AADB), University of Lucknow.
11. **Indo-US Research Fellowship for the year 2012** by the Indo-US Science and Technology Forum (IUSSTF) and Department of Science and Technology (DST), Government of India for conducting advanced research in the area of Life Sciences with Prof. Dr. Toni M. Kutchan at the Donald Danforth Plant Science Center, St. Louis, Missouri, USA.
12. **Award for an Outstanding Research Publication of CSIR-CIMAP** (as Team Member) for 2014, 2016, 2020, and 2021 (two papers).
13. **Raman Research Fellowship for the year 2017-18** by the Council of Scientific and Industrial Research, Government of India for conducting advanced research in the area of alkaloidomics with Prof. Dr. Michael Müller at the University of Freiburg, Freiburg, Germany.

Invited Lectures

1. Delivered an invited talk titled, “**Phytoceuticals: the future of plant-derived health aids**” by Suman PS Khanuja and Ashutosh K Shukla, at the 76th Annual Meeting of the Society of Biological Chemists (India) at SV University, Tirupati on 27th November, 2007.
2. Delivered an invited lecture on “**Bioinformatics: as the outcome of genomics-based research**” on 15 February, 2008 during the Hands on Training on Genome and Proteome Analysis (12-16 February, 2008) organized at the Department of Biochemistry, University of Lucknow, Lucknow, under the Bioinformatics Facility (BIF) of DBT.
3. Delivered an invited lecture titled, “**Catharanthus roseus – A model non-model plant for alkaloidomics research**” on 20 March, 2012 during the UGC SAP (DRS-I) sponsored National Seminar on Current Trends in Secondary Plant Metabolite Research (19-20 March, 2012) organized by the Department of Biotechnology, Faculty of Science, Jamia Hamdard, Hamdard Nagar, New Delhi 110062.
4. Delivered an invited lecture titled, “**Understanding Ayurveda – The plant way**” on 26 December 2013 at the symposium on Ayurvedic Biology held during the Indian National Science Academy (INSA) Anniversary Meet at SGPGI, Lucknow (26-28 December, 2013).
5. Delivered an invited lecture titled, “**Genomics Applications – Case Studies from Medicinal Plants and Microbes**” on 11 March 2015 during the short course on Recent Advances in Molecular Markers and Population Genomics at NBFGR, Lucknow (10-19 March, 2015).
6. Delivered an invited talk titled, “**Medicinal plants – From orphans to models through omics interventions**” on 05 June 2018 at the Institute of Pharmaceutical Sciences, Albert-Ludwigs-University Freiburg, Germany.
7. Delivered an invited talk titled, “**The Journey of Medicinal Plants from Orphans to Models: Facilitated Through Biotechnology-Based Approaches**” on 24 February 2021 to the B.Tech./M.Tech. (Biotechnology) students of Vignan's Foundation for Science Technology and Research (VFSTR), Guntur, Andhra Pradesh, in a webinar.
8. Delivered an invited talk titled, “**Alkaloid-producing Medicinal Plants: The Original Materia Medica**” on 02 September 2023 to research scholars through webinar organized by Team iGEM 2023 of IISER, Tirupati.

Publications (* Corresponding author) († Equal contributing first author) (†† Equal contributing second author)
(ORCID <https://orcid.org/0000-0003-3419-9129>)

Original Research Articles

1. **Ashutosh K Shukla**, Ajit K Shasany, Suman PS Khanuja, 2005. Isolation of poly (A)⁺ mRNA for downstream reactions from some medicinal and aromatic plants. *Indian Journal of Experimental Biology* **43**, 197-201.
2. Ajit K Shasany, Mahendra P Darokar, Sunita Dhawan, Anil K Gupta, Soni Gupta, **Ashutosh K Shukla**, Nirmal K Patra, Suman PS Khanuja, 2005. Use of RAPD and AFLP markers to identify inter- and intraspecific hybrids of *Mentha*. *Journal of Heredity* **96**, 542-549.
3. Ajit K Shasany, **Ashutosh K Shukla**, Soni Gupta, S Rajkumar, Suman PS Khanuja, 2005. AFLP analysis for genetic relationships among *Mentha* species. *Plant Genetic Resources Newsletter* **144**, 14-19.
4. **Ashutosh K Shukla**, Ajit K Shasany, Madan M Gupta, Suman PS Khanuja, 2006. Transcriptome analysis in *Catharanthus roseus* leaves and roots for comparative terpenoid indole alkaloid profiles. *Journal of Experimental Botany* **57**, 3921-3932.
5. Amita Misra, Ajit K Shasany, **Ashutosh K Shukla**, V Sundaresan, Seetal P Jain, Guru D Bagchi, Janardan Singh, Suman PS Khanuja, 2007. AFLP-based detection of adulterants in crude drug preparations of the ‘Safed Musli’ complex. *Natural Product Communications* **2**, 93-97.
6. Ajit K Shasany, **Ashutosh K Shukla**, Mahendra P Darokar, Megha Saraiya, Nidarshana Chaturvedi, Lankeshwar Tewari, Suman PS Khanuja, 2007. An alpha-1 antitrypsin genetic variant from India. *Indian Journal of Biochemistry and Biophysics* **44**, 176-178.
7. Abdul Samad, PV Ajayakumar, Mahesh K Gupta, **Ashutosh K Shukla**, Mahendra P Darokar, Bharat Somkuwar, Mansoor Alam, 2008. Natural infection of periwinkle (*Catharanthus roseus*) with *Cucumber mosaic virus*, subgroup IB. *Australasian Plant Disease Notes* **3**, 30-34.

8. Mukesh K Dubey, Ajit K Shasany, Om P Dhawan, **Ashutosh K Shukla**, Suman PS Khanuja, 2009. Genetic variation revealed in the chloroplast-encoded RNA polymerase β' subunit of downy mildew-resistant genotype of opium poppy. *Journal of Heredity* **100**, 76-85.
9. Mukesh K Dubey, Ajit K Shasany, Om P Dhawan, **Ashutosh K Shukla**, Suman PS Khanuja, 2010. Lipid peroxidation and antioxidant activities involved in resistance response against downy mildew in opium poppy. *Journal of Phytopathology* **158**, 88-92.
10. Mukesh K Dubey, Ajit K Shasany, Om P Dhawan, **Ashutosh K Shukla**, Suman PS Khanuja, 2010. AFLP studies on downy-mildew-resistant and downy-mildew-susceptible genotypes of opium poppy. *Journal of Genetics* **89**, 9-19.
11. **Ashutosh K Shukla**, Ajit K Shasany, Ram K Verma, Madan M Gupta, Ajay K Mathur, Suman PS Khanuja, 2010. Influence of cellular differentiation and elicitation on intermediate and late steps of terpenoid indole alkaloid biosynthesis in *Catharanthus roseus*. *Protoplasma* **242**, 35-47.
12. Amita Misra, Ajit K Shasany, **Ashutosh K Shukla**, Mahendra P Darokar, Subhash C Singh, V Sundaresan, Janardan Singh, Guru D Bagchi, Shital P Jain, Dharmendra Saikia, Suman PS Khanuja, 2010. AFLP markers for identification of *Swertia* species (Gentianaceae). *Genetics and Molecular Research* **9**, 1535-1544.
13. Mukesh K Dubey, Ajit K Shasany, Om P Dhawan, **Ashutosh K Shukla**, Karuna Shanker, Suman PS Khanuja, 2010. Detection of DNA polymorphism in *Papaver somniferum* genotypes differing in straw morphinan alkaloid content. *Plant Biosystems* **144**, 513-517.
14. Amita Misra, **Ashutosh K Shukla***, Ajit K Shasany, V Sundaresan, Shital P Jain, Subhash C Singh, Guru D Bagchi, Suman PS Khanuja, 2010. AFLP markers for identification of *Aconitum* species. In: AM Husaini (Ed.) Medicinal Plants of the Himalayas: Advances and Insights. *Medicinal and Aromatic Plant Science and Biotechnology* **4 (Special Issue 1)**, 15-19.
15. Abdul Samad, S Panda, Mahesh K Gupta, PV Ajayakumar, **Ashutosh K Shukla**, 2011. Molecular identification of a phytoplasma associated with Ajwain (*Trachyspermum ammi*) in India. *European Journal of Plant Pathology* **130**, 1-4.
16. Uzma Faridi, Brijesh S Sisodia, **Ashutosh K Shukla**, Rakesh K Shukla, Mahendra P Darokar, Upendra N Dwivedi, Ajit K Shasany, 2011. Proteomics indicates modulation of tubulin polymerization by l-menthol inhibiting human epithelial colorectal adenocarcinoma cell proliferation. *Proteomics* **11**, 2115-2119.
17. Shaifali Pal[†], Shefali Singh[†], **Ashutosh K Shukla**, Madan M Gupta, Suman PS Khanuja, Ajit K Shasany, 2011. Comparative withanolide profiles, gene isolation, and differential gene expression in the leaves and roots of *Withania somnifera*. *The Journal of Horticultural Science & Biotechnology* **86**, 391-397.
18. Ashutosh Awasthi, Nidhi Bharti, Priya Nair, Rakshpal Singh, **Ashutosh K Shukla**, Madan M Gupta, Mahendra P Darokar, Alok Kalra, 2011. Synergistic effect of *Glomus mosseae* and nitrogen fixing *Bacillus subtilis* strain Daz26 on artemisinin content in *Artemisia annua* L. *Applied Soil Ecology* **49**, 125-130.
19. Abdul Samad, Seema Dharni, Mridula Singh, Sneha Yadav, Asifa Khan, **Ashutosh K Shukla**, 2011. First report of a natural infection of *Stevia rebaudiana* by a group 16SrXXIV phytoplasma in India. *Plant Disease* **95**, 1582.
20. Nagawara Seshagirirao Ravindra, Srinivas Iyer Ramesh, Mahesh Kumar Gupta, Tripta Jhang, **Ashutosh K Shukla**, Mahendra Pandurang Darokar, Raghavendra Narayanrao Kulkarni, 2012. Evaluation of somaclonal variation for genetic improvement of Patchouli (*Pogostemon patchouli*), an exclusively vegetatively propagated aromatic plant. *Journal of Crop Science and Biotechnology* **15**, 33-39.
21. **Ashutosh K Shukla**, Ajit K Shasany, Suman PS Khanuja, 2012. cDNA-AFLP-based numerical comparison of leaf and root organ cDNAs in *Catharanthus roseus*. *OMICs: A Journal of Integrative Biology* **16**, 397-401.
22. Rashmi Tiwari[†], Ashutosh Awasthi[†], Maneesha Mall[†], **Ashutosh K Shukla**, KVN Satya Srinivas, KV Syamasundar, Alok Kalra, 2013. Bacterial endophyte-mediated enhancement of *in planta* content of key terpenoid indole alkaloids and growth parameters of *Catharanthus roseus*. *Industrial Crops and Products* **43**, 306-310.
23. **Ashutosh K Shukla***, Maneesha Mall, Santosh K Rai, Shefali Singh, Priya Nair, Gaurav Parashar, Ajit K Shasany, Subhash C Singh, Vinod K Joshi, Suman PS Khanuja, 2013. A transcriptomic approach for exploring the molecular basis for *dosha*-balancing property-based classification of plants in Ayurveda. *Molecular Biology Reports* **40**, 3255-3262.
24. Priya Nair, Amita Misra, Alka Singh, **Ashutosh K Shukla**, Madan M Gupta, Anil K Gupta, Vikrant Gupta, Suman PS Khanuja, Ajit K Shasany, 2013. Differentially expressed genes during contrasting growth stages of *Artemisia annua* for artemisinin content. *PLoS One* **8(4)**, e60375. (doi:10.1371/journal.pone.0060375).
25. Nidarshana Chaturvedi, Sharad K Singh, **Ashutosh K Shukla**, Raj K Lal, Madan M Gupta, Upendra N Dwivedi, Ajit K Shasany, 2014. Latex-less opium poppy: Cause for less latex and reduced peduncle strength. *Physiologia Plantarum* **150**, 436-445.
26. Nidarshana Chaturvedi[†], Mridula Singh[†], **Ashutosh K Shukla***, Ajit K Shasany, Karuna Shanker, Raj K Lal, Suman PS Khanuja, 2014. Comparative analysis of *Papaver somniferum* genotypes having contrasting latex and alkaloid profiles. *Protoplasma* **251**, 857-867.
27. Birendra Kumar, **Ashutosh K Shukla**, Abdul Samad, 2014. Development and characterization of the menthofuran-rich inter-specific hybrid peppermint variety CIMAP-Patra. *Molecular Breeding* **34**, 717-724.
28. Mahendra P Darokar, Sunita S Dhawan, **Ashutosh K Shukla**, Sanjog T Thul, Raj K Lal, Ajit K Shasany, Suman PS Khanuja, 2014. Assessment of genetic relatedness among selected cultivars of opium poppy (*Papaver somniferum* L.) through DNA profiling. *Acta Horticulturae (ISHS)* **1036**, 21-28.
29. Sharad K Singh, **Ashutosh K Shukla**, Om P Dhawan, Ajit K Shasany, 2014. Recessive loci *Pps-1* and *OM* differentially regulate *PISTILLATA-1* and *APETALA3-1* expression for sepal and petal development in *Papaver somniferum*. *PLoS One* **9(6)**, e101272. (doi: 10.1371/journal.pone.0101272).

30. Megan M. Augustin, Dan R. Ruzicka, **Ashutosh K. Shukla**, Jörg M. Augustin, Courtney M. Starks, Mark O'Neil-Johnson, Michael R. McKain, Bradley S. Evans, Matt D. Barrett, Ann Smithson, Gane Ka-Shu Wong, Michael K. Deyholos, Patrick P. Edger, J. Chris Pires, James H. Leebens-Mack, David A. Mann, Toni M. Kutchan, 2015. Elucidating steroid alkaloid biosynthesis in *Veratrum californicum*: production of verazine in Sf9 cells. *The Plant Journal* **82**, 991-1003.
31. Priyanka Mishra, L. Dinesh Kumar, Amit Kumar, Sivaraman Gokul, Kaliamoorthy Ravikumar, **Ashutosh K. Shukla**, Velusamy Sundaresan, 2015. Population dynamics and conservation implications of *Decalepis arayalpathra* (J. Joseph and V. Chandras.) Venter., a steno endemic species of Western Ghats, India. *Applied Biochemistry and Biotechnology* **176**, 1413-1430.
32. Krishna Kumar, Sarma Rajeev Kumar, Varun Dwivedi, Avanish Rai, **Ashutosh K. Shukla**, Karuna Shanker, Dinesh A. Nagegowda, 2015. Precursor feeding studies and molecular characterization of *GERANIOL SYNTHASE* establish the limiting role of geraniol in monoterpene indole alkaloid biosynthesis in *Catharanthus roseus* leaves. *Plant Science* **239**, 56-66.
33. Uzma Faridi[†], Sunita S. Dhawan[†], Shaifali Pal, Sanchita Gupta, **Ashutosh K. Shukla**, Mahendra P. Darokar, Ashok Sharma, Ajit K. Shasany, 2016. Repurposing L-menthol for systems medicine and cancer therapeutics? L-menthol induces apoptosis through caspase 10 and by suppressing HSP90. *OMICS: A Journal of Integrative Biology* **20**, 53-64.
34. Shiv S. Pandey[†], Sucheta Singh[†], C.S. Vivek Babu, Karuna Shanker, N.K. Srivastava, **Ashutosh K. Shukla**, Alok Kalra, 2016. Fungal endophytes of *Catharanthus roseus* enhance vindoline content by modulating structural and regulatory genes related to terpenoid indole alkaloid biosynthesis. *Scientific Reports* **6**, 26583. (doi: 10.1038/srep26583).
35. Amit Kumar, Priyanka Mishra, Kuppusamy Baskaran, **Ashutosh K. Shukla**, Ajit K. Shasany, Velusamy Sundaresan, 2016. Higher efficiency of ISSR markers over plastid *psbA-trnH* region in resolving taxonomical status of genus *Ocimum* L. *Ecology and Evolution* **6**, 7671-7682. (doi: 10.1002/ece3.2483).
36. Priyanka Mishra, Amit Kumar, Vereena Rodrigues, **Ashutosh K. Shukla**, Velusamy Sundaresan, 2016. Feasibility of nuclear ribosomal region ITS1 over ITS2 in barcoding taxonomically challenging genera of subtribe Cassiinae (Fabaceae). *PeerJ* **4**, e2638. (doi: 10.7717/peerj.2638).
37. Sharad K. Singh[†], Soni Gupta[†], Noor Ahmad, **Ashutosh K. Shukla**, Ajit K. Shasany, Raj K. Lal, Madan M. Gupta, Om P. Dhawan, 2017. Variability and heritability studies in floral homeotic mutants of *Papaver somniferum* L. *Industrial Crops and Products* **95**, 276-285. (doi: 10.1016/j.indcrop.2016.10.032).
38. Megan M. Augustin, **Ashutosh K. Shukla**, Courtney M. Starks, Mark O'Neil-Johnson, Linna Han, Cynthia K. Holland, Toni M. Kutchan, 2017. Biosynthesis of *Veratrum californicum* specialty chemicals in *Camelina sativa* seed. *Plant Biotechnology Reports* **11**, 29-41. (doi: 10.1007/s11816-017-0427-x).
39. Priyanka Mishra, Amit Kumar, Akshitha Nagireddy, **Ashutosh K. Shukla**, Velusamy Sundaresan, 2017. Evaluation of single and multilocus DNA barcodes towards species delineation in complex tree genus *Terminalia*. *PLoS One* **12(8)**, e0182836. (doi: 10.1371/journal.pone.0182836).
40. Priyanka Mishra, Amit Kumar, Sivaraman Gokul, **Ashutosh K. Shukla**, Kaliamoorthy Ravikumar, Adrian Slater, Velusamy Sundaresan, 2017. Character-based DNA barcoding for authentication and conservation of IUCN Red listed threatened species of genus *Decalepis* (Apocynaceae). *Scientific Reports* **7**, 14910. (doi: 10.1038/s41598-017-14887-8). [Correction: *Scientific Reports* **10**, 17942 (2020). doi: 10.1038/s41598-020-74406-0]
41. Amit Kumar, Vereena Rodrigues, Priyanka Mishra, Kuppusamy Baskaran, **Ashutosh K. Shukla**, Ajit K. Shasany, Velusamy Sundaresan, 2018. ISSR-derived species-specific SCAR marker for rapid and accurate authentication of *Ocimum tenuiflorum* L. *Planta Medica* **84**, 117-122. (doi: 10.1055/s-0043-116853).
42. Priyanka Mishra, **Ashutosh K. Shukla**, Velusamy Sundaresan, 2018. Candidate DNA barcode tags combined with high resolution melting (Bar-HRM) curve analysis for authentication of *Senna alexandrina* Mill. with validation in crude drugs. *Frontiers in Plant Science* **9**, 283. (doi: 10.3389/fpls.2018.00283)
43. Priya Nair, Ajit K. Shasany, Feroz Khan, **Ashutosh K. Shukla**^{*}, 2018. Differentially expressed peroxidases from *Artemisia annua* and their responses to various abiotic stresses. *Plant Molecular Biology Reporter* **36**, 295-309. (doi: 10.1007/s11105-018-1078-y)
44. Maneesha Mall, Ram K. Verma, Madan M. Gupta, Ajit K. Shasany, Suman P.S. Khanuja, **Ashutosh K. Shukla**^{*}, 2019. Influence of seasonal and ontogenic parameters on the pattern of key terpenoid indole alkaloids biosynthesized in the leaves of *Catharanthus roseus*. *South African Journal of Botany* **123**, 98-104.
45. Vineet Yadav, Shilpi Jain, Pooja Mishra, Puja Khare, **Ashutosh K. Shukla**, Tanmay Karak, Anil K. Singh, 2019. Amelioration in nutrient mineralization and microbial activities of sandy loam soil by short term field aged biochar. *Applied Soil Ecology* **138**, 144-155.
46. Priya Nair, Maneesha Mall, Pooja Sharma, Feroz Khan, Dinesh A. Nagegowda, Prasant K. Rout, Madan M. Gupta, Alok Pandey, Ajit K. Shasany, Anil K. Gupta, **Ashutosh K. Shukla**^{*}, 2019. Characterization of a class III peroxidase from *Artemisia annua*: relevance to artemisinin metabolism and beyond. *Plant Molecular Biology* **100**, 527-541. (doi: 10.1007/s11103-019-00879-x)
47. Chandrashekar Sandeep[†], Amit Kumar[†], Vereena Rodrigues, Syam Viswanath, **Ashutosh K. Shukla**, Velusamy Sundaresan, 2020. Morpho-genetic divergence and population structure in Indian *Santalum album* L. *Trees* **34**, 1113-1129. (doi: 10.1007/s00468-020-01963-2)
48. Sivaraman Gokul, Vereena Rodrigues, Amit Kumar, Ram S. Verma, **Ashutosh K. Shukla**, Velusamy Sundaresan, 2020. Population genetics coupled chemical profiling for conservation implications of *Decalepis salicifolia* (Bedd. ex Hook.f.)

- Venter, an endemic and critically endangered species of Western Ghats, India. *Biochemical Genetics* **58**, 452–472. (doi: 10.1007/s10528-020-09958-x)
49. Amit Kumar, Vereena Rodrigues, Kuppusamy Baskaran, **Ashutosh K. Shukla**, Velusamy Sundaresan, 2020. DNA barcode based species-specific marker for *Ocimum tenuiflorum* and its applicability in quantification of adulteration in herbal formulations using qPCR. *Journal of Herbal Medicine* **23**, 100376. (doi: 10.1016/j.hermed.2020.100376)
 50. Anil K. Gupta^{†*}, **Ashutosh K. Shukla^{†*}**, Pooja Singh^{††}, Maneesha Mall^{††}, Seema Yadav, Ajit K. Shasany, Karuna Shanker, K. Baskaran, Velusamy Sundaresan, Mohammed Talha, Abhilasha Srivastava, Soni Gupta, Puja Khare, Daya N. Mani, Abdul Samad, 2020. CIM-Sushil: A high vindoline yielding variety of *Catharanthus roseus* (L.) G. Don. *Journal of Medicinal and Aromatic Plant Sciences* **42**, 51-63. [Cover Article]
 51. Venkatesha K.T., Ved R. Singh, Rajendra C. Padalia, Rakesh K. Upadhyay, Amit Chauhan, Amit K. Tiwari, Sonveer Singh, Gunjan Bhatt, Divya, Pragya Pandey, Ram S. Verma, Maneesha Mall, **Ashutosh K. Shukla**, Chandan S. Chanotiya, Sanjay Kumar, Birendra Kumar, Anil K. Gupta, Rajesh K. Verma, Abdul Samad, Pankaj Kumar, Mohit C. Rawat, 2020. CIM-Unnati: An essential oil rich variety of menthol mint (*Mentha arvensis* L.). *Journal of Medicinal and Aromatic Plant Sciences* **42**, 73-79. [Cover Article]
 52. Dewasya P. Singh[†], Amit Kumar[†], Vereena Rodrigues, K.N. Prabhu, Amit Kaushik, Daya N. Mani^{*}, **Ashutosh K. Shukla^{*}**, Velusamy Sundaresan^{*}, 2020. DNA barcoding coupled with secondary structure information enhances *Achyranthes* species resolution. *Journal of Applied Research on Medicinal and Aromatic Plants* **19**, 100269. (doi: 10.1016/j.jarmap.2020.100269)
 53. Paurabi Das, Puja Khare, Raghavendra Pratap Singh, Vineet Yadav, Pratibha Tripathi, Anuj Kumar, Versha Pandey, Pooja Gaur, Asha Singh, Ram Das, Channayya Hiremath, Ashutosh Kumar Verma, **Ashutosh K. Shukla**, Karuna Shanker, 2021. Arsenic-induced differential expression of oxidative stress and secondary metabolite content in two genotypes of *Andrographis paniculata*. *Journal of Hazardous Materials* **406**, 124302. (doi: 10.1016/j.jhazmat.2020.124302)
 54. Maneesha Mall[†], Pooja Singh[†], Ritesh Kumar, Karuna Shanker, Anil K. Gupta, Puja Khare, Ajit K. Shasany, Sayyada Khatoon, Velusamy Sundaresan, K. Baskaran, Seema Yadav, **Ashutosh K. Shukla^{*}**, 2021. Phenotypic, genetic and expression profiling of a vindoline-rich genotype of *Catharanthus roseus*. *South African Journal of Botany* **139**, 50-57.
 55. Bhaskar Shukla, Sanchita Gupta, Gaurava Srivastava, Ashok Sharma, **Ashutosh K. Shukla**, Ajit K. Shasany, 2021. IncRNADetector: A bioinformatics pipeline for long non-coding RNA identification and MAPsInc: A repository of medicinal and aromatic plant lncRNAs. *RNA Biology* **18**, 2290-2295. (doi: 10.1080/15476286.2021.1899673)
 56. Nidhi Nigam, Puja Khare, Mohd Ahsan, Vineet Yadav, Karuna Shanker, Raghavendra Pratap Singh, Versha Pandey, Paurabi Das, Anupama Singh, Ranu Yadav, Pratibha Tripathi, Geet Govind Sinam, **Ashutosh K. Shukla**, Tanmoy Karak, 2021. Biochar amendment reduced the risk associated with metal uptake and improved metabolite content in medicinal herbs. *Physiologia Plantarum* **173**, 321-339. (doi: 10.1111/ppl.13393)
 57. Amit Kumar, Vereena Rodrigues, Sanchi Verma, Manju Singh, Channaya Hiremath, Karuna Shanker, **Ashutosh K. Shukla**, Velusamy Sundaresan, 2021. Effect of salt stress on seed germination, morphology, biochemical parameters, genomic template stability, and bioactive constituents of *Andrographis paniculata* Nees. *Acta Physiologiae Plantarum* **43**, 68. (doi: 10.1007/s11738-021-03237-x)
 58. Vereena Rodrigues, Amit Kumar, Kamasamudra N. Prabhu, V.S. Pragadheesh, **Ashutosh K. Shukla**, Velusamy Sundaresan, 2021. Adventitious root cultures of *Decalepis salicifolia* for the production of 2-hydroxy-4-methoxybenzaldehyde, a vanillin isomer flavor metabolite. *Applied Microbiology and Biotechnology* **105**, 3087-3099. (doi: 10.1007/s00253-021-11262-6)
 59. Priyambada Singh, Vineet Yadav, Yogita Deshmukh, Paurabi Das, Raghavendra Pratap Singh, Nasreen Bano, Mithun Kumar, **Ashutosh K. Shukla**, Alok Krishna, Puja Khare, 2021. Decoding the link between bacterial diversity and enzymatic activities of soil from *Cymbopogon flexuosus* growing dryland. *Applied Soil Ecology* **168**, 104150. (doi: 10.1016/j.apsoil.2021.104150)
 60. Maneesha Mall, Karuna Shanker, Abdul Samad, Alok Kalra, Velusamy Sundaresan, **Ashutosh K. Shukla^{*}**, 2022. Stress responsiveness of vindoline accumulation in *Catharanthus roseus* leaves is mediated through co-expression of allene oxide cyclase with pathway genes. *Protoplasma* **259**, 755-773. (doi: 10.1007/s00709-021-01701-6)
 61. K.N. Prabhu, Vereena Rodrigues, Amit Kumar, Manish Kumar, Sharad Srivastava, **Ashutosh K. Shukla**, Velusamy Sundaresan, 2023. Genetic diversity and population structure assessment of *Hellenia speciosa* from Indian agro-ecological regions using inter-simple sequence repeat markers. *Horticulture, Environment, and Biotechnology*. (doi: 10.1007/s13580-022-00466-y)
 62. Maneesha Mall, Karuna Shanker, Dinesh A. Nagegowda, Abdul Samad, Alok Kalra, Alok Pandey, Velusamy Sundaresan, **Ashutosh K. Shukla^{*}**, 2023. Temperature-induced lipocalin-mediated membrane integrity: possible implications for vindoline accumulation in *Catharanthus roseus* leaves. *Physiologia Plantarum*, (Accepted)

Review Articles

1. Alka Singh, **Ashutosh K Shukla**, Ajit K Shasany, Mahendra P Darokar, Suman PS Khanuja, 2008. Impact of genomics on aroma research. *Journal of Medicinal and Aromatic Plant Sciences* **30**, 276-280.
2. Mridula Singh[†], Nidarshana Chaturvedi[†], Ajit K Shasany, **Ashutosh K Shukla^{*}**, 2014. Impact of promising genotypes of *Papaver somniferum* L. developed for beneficial uses. *Acta Horticulturae (ISHS)* **1036**, 29-41.
3. Priyanka Mishra, Amit Kumar, Akshitha Nagireddy, Daya N. Mani, **Ashutosh K Shukla**, Rakesh Tiwari, Velusamy Sundaresan, 2016. DNA barcoding: An efficient tool to overcome authentication challenges in the herbal market. *Plant Biotechnology Journal* **14**, 8-21.

4. Vereena Rodrigues, Amit Kumar, Sivaraman Gokul, **Ashutosh K. Shukla**, Kaliamoorthy Ravikumar, Velusamy Sundaresan, 2021. *Decalepis salicifolia* (Bedd. ex Hook. f.) Venter: A steno-endemic and critically endangered medicinal and aromatic plant from Western Ghats, India. *Journal of Biosciences* **46**, 44.

Book Chapters

1. Ajit K Shasany, **Ashutosh K Shukla**, Suman PS Khanuja, 2007. Medicinal and Aromatic Plants. In: C Kole (Ed.) *Genome Mapping and Molecular Breeding in Plants*, Volume 6 Technical Crops, Springer-Verlag Berlin Heidelberg, pp 175-196.
2. Suman PS Khanuja, **Ashutosh K Shukla**, 2011. Human health and nutrition: Functional foods. In: KL Chadha, AK Singh, VB Patel (Eds.) *Horticulture to Horti-Business*, Souvenir of the Fourth Indian Horticulture Congress held at New Delhi during 18-21 November, 2010, Westville Publishing House, New Delhi, pp 433-445.
3. **Ashutosh K Shukla**, Suman PS Khanuja, 2013. *Catharanthus roseus*: The metabolome that represents a unique reservoir of medicinally important alkaloids under precise genomic regulation. In: Debmalya Barh (Ed.) *OMICS Applications in Crop Science*, CRC Press (Taylor & Francis Group), Boca Raton, pp 325–384. (doi: 10.1201/b16352-11)
4. Suman PS Khanuja, **Ashutosh K Shukla**, 2014. Medicinal plant metabolomes: Converging Botany and Chemistry into health opportunity. In: Muhammad Iqbal, Altaf Ahmad (Eds.) *Current Trends in Medicinal Botany*, I.K. International Publishing House Pvt. Ltd., New Delhi, pp 346-370.
5. **Ashutosh K Shukla**, Ajit K Shasany, Suman PS Khanuja, 2018. Research and development on *Artemisia annua* in India. In: Brahma Singh, K.V. Peter (Eds.) *New Age Herbs*, Springer, Singapore, pp 15-27. (doi: 10.1007/978-981-10-8291-7_2)
6. Amit Kumar, **Ashutosh K. Shukla**, Ajit K. Shasany, Velusamy Sundaresan, 2018. Systematic position, phylogeny, and taxonomic revision of Indian *Ocimum*. In: A.K. Shasany, C. Kole (Eds.) *The Ocimum Genome. Compendium of Plant Genomes*, Springer, Cham, pp 61-72. (doi: 10.1007/978-3-319-97430-9_5)
7. Daya N. Mani, Amit Kaushik, Harshika Khanna, Dewasya P. Singh, Ajay Kumar, Manish K. Patel, Maneesha Mall, Pallavi Pandey, V. Sundaresan, Karuna Shanker, **Ashutosh K. Shukla**, Kamal Sachdev, 2020. Anti-allergic property-based screening and validation of medicinal plants described in *Ayurveda*. In: SubbaRao V. Madhunapantula (Ed.) *Drug Development from Natural Resources: Scope and Challenges*, A Publication from the Centre for Science & Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre), Allied Publishers Pvt. Ltd., New Delhi, pp 46-57.
8. Maneesha Mall[†], Pooja Singh[†], Seema Yadav[†], Velusamy Sundaresan, Daya N. Mani, Ajit K. Shasany, **Ashutosh K. Shukla***, 2022. Future prospects for research on *Catharanthus roseus*. In: C. Kole (Ed.) *The Catharanthus Genome, Compendium of Plant Genomes*, Springer, Cham, pp 175-183. (doi: 10.1007/978-3-030-89269-2_10)

Popular Articles

1. Daya N. Mani, **Ashutosh K Shukla**, 2014. Mutra janit rogon se bachav. (Article in Hindi) In: CIMAP Rajbhasha Patrika *Sugandh* **3**, 26.
2. Dewasya P. Singh, Amit Kaushik, Amit Kumar, **Ashutosh K Shukla**, Velusamy Sundaresan, Daya N. Mani, 2018. Kamla rog: Ayurved ka drishtikon. (Article in Hindi) In: CIMAP Rajbhasha Patrika *Sugandh* **7**, 30-33.
3. Amit Kaushik, Dewasya P. Singh, **Ashutosh K. Shukla**, Daya N. Mani, 2018. Tridosh ke aadhar par manav prakriti nirdharan (Article in Hindi) In: CIMAP Rajbhasha Patrika *Sugandh* **7**, 34-37.
4. **Ashutosh K. Shukla***, 2019. Simple and economical technologies for enhancing income in agriculture. *Flora Sarthi* (Special Launch Issue August), 14-16.
5. Amit Kaushik, Dewasya P. Singh, Mridula Sahu, Manish Patel, Pratibha, **Ashutosh K. Shukla**, Daya N. Mani, 2021. Ayurved me allergy ka varnan evam upchar (Article in Hindi). *AUS Vigyan* **1**, 49-51.
6. Mridula Sahu, Amit Kaushik, Dewasya Pratap Singh, Aakriti Gupta, **Ashutosh K. Shukla**, Daya N. Mani, 2021. Ayurved me ulcerative colitis (IBD) ka varnan evam bachav (Article in Hindi). *AUS Vigyan* **2**, 57-58.
7. Aakriti Gupta, Mridula Sahu, Amit Kaushik, Dewasya Pratap Singh, **Ashutosh K. Shukla**, Daya N. Mani, 2021. Jwar (Pyrexia): Ayurvedic paripekshya (Article in Hindi). *AUS Vigyan* **2**, 75-77.
8. Maneesha Mall, Karuna Shanker, Abdul Samad, Alok Kalra, Velusamy Sundaresan, **Ashutosh K. Shukla***, 2022. *Catharanthus roseus* ki pattiyon me vindoline sanchay ki stress praktikriya allene oxide cyclase ki pathway genes ke saath sah-abhivyakti dwara sanchalit hoti hai (Article abstract in Hindi). *AUS Vigyan* **3**, 20.
9. Dewasya P. Singh, Amit Kumar, Vereena Rodrigues, K.N. Prabhu, Amit Kaushik, Daya N. Mani*, **Ashutosh K. Shukla***, Velusamy Sundaresan*, 2022. DNA barcoding takniki, Dwitiya sanrachna ki jankari ke saath milkar *Achyranthes* prajatiyon ki pehchan ko sunisshit karne me madad karta hai (Article abstract in Hindi). *AUS Vigyan* **3**, 22.
10. Aakriti Gupta, Mridula Sahu, Ashcharya U. Mishra, Amit Kaushik, Dewasya P. Singh, **Ashutosh K. Shukla**, Daya N. Mani, 2022. Jwar vyadhi ka varnan: Ayurved evam adhunik vigyan (Article in Hindi). *AUS Vigyan* **3**, 47-49.
11. Ashcharya U. Mishra, Aakriti Gupta, Mridula Sahu, Amit Kaushik, Dewasya P. Singh, **Ashutosh K. Shukla**, Daya N. Mani, 2022. Aamvat rog ka prayogik jantuon par vyadhi nirdharan (Rheumatoid arthritis model) (Article in Hindi). *AUS Vigyan* **3**, 52-54.
12. Pratibha, Neerja Tiwari, Velusamy Sundaresan, Daya N. Mani, Karuna Shanker, **Ashutosh K. Shukla**, 2022. Vansh (Genus) *Tylophora*: Prakriti ka alp anveshit aushadhiya khazana (Article in Hindi). *AUS Vigyan* **3**, 107-110.
13. Pratibha, Mridula Sahu, Amit Kaushik, Velusamy Sundaresan, **Ashutosh K. Shukla**, Daya N. Mani, 2022. Asthma ke upchar hetu bhartiya chikitsa padyatiyan (Article in Hindi). *AUS Vigyan* **3**, 111-114.

14. Seema Yadav, **Ashutosh K. Shukla***, 2023. Zinc - A micronutrient with macro roles in plant health. *Flora Sarthi* (9th Issue, July), 7-10.

Patents (9 Granted; 1 Filed)

1. Strain of *Bacillus* as a bioinoculant. US Patent No. 7,211,428 (May 1, 2007).
2. Primers and a screening method for identification of artemisinin producing plants.
 - i. Indian Patent No. 234832 (June 17, 2009)
 - ii. US Patent No. 7,473,768 (January 6, 2009)
 - iii. Canada Patent No. CA 2551627 (February 21, 2012)
 - iv. Australian Patent No. AU2003290404 (October 29, 2009)
 - v. China Patent No. ZL200380110931.7 (September 8, 2010)
 - vi. Madagascar Patent No. 029/08 (January 13, 2009)
 - vii. South Africa Patent No. 2006/6250 (September 25, 2008)
 - viii. Vietnam Patent No. 7463 (January 8, 2009)
3. A new, high seed and silymarin yielding plant of *Silybum marianum*, 'CIM-LIV'. Ref. No.: 36NF2005. Filed in USA.

Technologies Developed

1. **CIM-Grow** – a highly effective plant growth promoter derived from a superior bacterial strain (*Bacillus* sp CIMAP B1) (2004). (Team Member)
2. **CSIR-CIMAP Cough Syrup** – An *Ayurveda*-based polyherbal cough syrup (2016). (Team Member)
3. **CIM-Mridashakti** – A soil fertility enhancer made from distilled waste of aromatic crops (2020). (Team Member)

Plant Variety Developed

1. **CIM-Sushil** - A high vindoline yielding variety of *Catharanthus roseus* (L.) G. Don (2019). (Team Leader)
2. **CIM-Liv** - A new, high seed and silymarin yielding plant of *Silybum marianum* (2005). (Team Member)
3. **CIMAP-Patra** – A menthofuran-rich inter-specific hybrid peppermint variety (2010). (Team Member)
4. **CIM-Unnati** – A new essential oil rich variety of menthol mint (*Mentha arvensis*) (2020). (Team Member)

Membership of Scientific Societies and Scientific Responsibilities

- Life member of the Indian Science Congress Association, Kolkata.
- Life member of the Medicinal and Aromatic Plant Society of India, Lucknow.
- Life member of the Society of Biological Chemists (India), Bangalore.
- Life member of the Alumni Association of Department of Biochemistry, University of Lucknow. Executive Committee member of the same since January 2012.
- Member, Scientific Committee, First International Symposium on *Papaver* organized by CSIR-CIMAP and the International Society for Horticultural Science (ISHS) at CSIR-CIMAP, Lucknow during 7-11 February, 2011. Co-chaired a session on the theme, “Genetic Resources and Crop Improvement”, as well as the poster session.
- Editor, *Journal of Medicinal and Aromatic Plant Sciences* (CSIR-CIMAP, India) (2010 onwards).
- Reviewer for *Protoplasma*, *Journal of Plant Physiology*, *OMICS: A Journal of Integrative Biology*, *Plant Genetic Resources*, *African Journal of Biotechnology*, *Journal of Medicinal and Aromatic Plant Sciences*, *Natural Product Communications*, *Plant Cell Reports*, *PLoS ONE*, *Journal of Genetics*, *Plant Disease*, *Plant Physiology and Biochemistry*, *The Journal of Horticultural Science and Biotechnology*, *Proceedings of the National Academy of Sciences, India Section B Biological Sciences*, *RNA Biology*, *Journal of Plant Growth Regulation*, *Journal of Applied Research on Medicinal and Aromatic Plants*, *Industrial Crops and Products*, *South African Journal of Botany*, *Acta Physiologiae Plantarum*, *Physiology and Molecular Biology of Plants*, *Molecular Genetics and Genomics*, *Journal of Experimental Botany*, *Plant Cell Reports*, etc.
- Member, Local Organizing Committee, 80th Annual Meeting of the Society of Biological Chemists (India) on the theme “Metabolic pathway modulations – Applications in health and agriculture” organized by CSIR-CIMAP at CIMAP, Lucknow during 12-15 November, 2011.
- Life member of Association of Knowledge Workers, Lucknow.
- Member, Core Committee, CSIR-CIMAP activities for the Second Meeting of Medicinal Plant Focal Points of Indian Ocean Rim Association Regional Centre for Science and Technology Transfer (IORA RCSTT) cum Exhibition held at Lucknow during 18-19 March, 2015.
- Member, Scientific Committee, International Conference on Medicinal Plants: Resource for Affordable New Generation Healthcare (ICOMP-2015) organized by CSIR-CIMAP at Lucknow during 20-22 March, 2015.
- Expert/Mentor in the area of Agriculture and Allied Sciences for WOS-B projects (leading to societal benefits), funded by KIRAN division of DST. Mentoring workshop conducted on 05 December, 2019 at CSIR-CIMAP, Lucknow.
- Served on various committees of SERB, DST at various time points – as Co-opted Member of the Programme Advisory Committee (PAC) on Organismal and Evolutionary Biology (OEB); Member, PAC for a special call; Domain Expert in the PCR (Project Completion Report) Evaluation Committee for OEB - Plant Science; Special Invitee in the preliminary

screening committee for SERB POWER (Promoting Opportunities for Women in Exploratory Research) Grant for Life Sciences.

- Member, Selection Committee of the Stage-I Youth Parliament Debate Competition Event (Mission LiFE – Lifestyle for Environment) on the theme “Individual behaviour & habits have an impact on environment and climate change” jointly organized by NBRI-EIACP and IWSLU-EIACP Programme Centers for the state of Uttar Pradesh at CSIR-NBRI, Lucknow, on 17 May 2023. The event was held under the auspices of Environmental Information, Awareness, Capacity Building and Livelihood Programme (EIACP), Ministry of Environment, Forest and Climate Change (MoEF&CC) Govt. of India.

Number of papers presented as abstracts in seminar/symposia – 57

Number of popular articles/abstracts published - 14

Number of laboratory manuals edited – 2

Number of sequences submitted to GenBank (NCBI) – 2610

Number of Microarray Data Submission to GEO (NCBI) – 2

Number of Protein Model DataBase (PMDB) Submission - 1

Number of scientific projects involved in (as PI, Co-PI, Investigator) - 33

Number of visits / conferences / seminars / meets/ workshops / schools / trainings participated / contributed in – 97

Number of lectures delivered in schools / workshops / institute seminars – 26

Number of schools / trainings convened - 4

Number of MSc / MTech / BTech dissertations guided – 15

Number of MSc / MTech / BTech scholars guided under CSIR-SRTP 2020 program – 01

Number of MSc interns guided under SERB Scientific Social Responsibility - 01

Number of research scholars (Project Assistants / Project Associates / Research Associates / JRFs / SRFs in various projects tenable at CIMAP) guided - 22

Number of PhDs guided – 03 (Continuing), 04 (Awarded), 02 (Submitted); Co-guided – 01 (Continuing), 01 (Awarded), 01 (Submitted)

(Dr. Ashutosh K. Shukla)