

Curriculum Vitae

Dr. Sumit Ghosh

Senior Principal Scientist
Plant Biotechnology Division
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<https://sumitg80.wixsite.com/website> (Lab website)
<https://scholar.google.co.in/citations?user=w2JTTEAAAAJ&hl=en>
<https://www.researchgate.net/profile/Sumit-Ghosh-12>

Education:

- B.Sc. (Ag.) Hons (1997-2001), Visva-Bharati, West Bengal, India.
- M.Sc. (Ag.) in Genetics (2001-2003), Bidhan Chandra Krishi Viswavidyalaya, West Bengal, India. 1st Rank.
- Ph.D. (2004-2009), Jawaharlal Nehru University (National Institute of Plant Genome Research), New Delhi, India. 1st Rank in course-work examination.

Professional Positions Held:

- January, 2020 to Present: Senior Principal Scientist, CSIR-Central Institute of Medicinal and Aromatic Plants, Lucknow
- January, 2016 to January, 2020: Principal Scientist, CSIR-Central Institute of Medicinal and Aromatic Plants, Lucknow
- January, 2020 to Present: Associate Professor (Honorary position), Academy of Scientific and Innovative Research (AcSIR), Ghaziabad
- July to September, 2017: Visiting Scientist, Department of Chemistry, University of Hamburg, Germany.
- January, 2013 to January, 2016: Senior Scientist, CSIR-Central Institute of Medicinal and Aromatic Plants, Lucknow
- April, 2011- January, 2013: Scientist Fellow, CSIR-Central Institute of Medicinal and Aromatic Plants, Lucknow.
- June, 2009- April, 2011: Postdoctoral fellow, National Institute of Plant Genome Research, New Delhi.

Research Interests: Plant specialized metabolism, terpene biochemistry, terpene pathway elucidation and reconstruction in heterologous hosts, metabolic engineering and synthetic biology, multi-omics and functional genomics.

PhD Courses Taught:

- Plant Secondary Metabolism (AcSIR-10-ID-009); Biochemistry (BTB102); Fundamentals of Molecular Genetics (BTB201); Genome Editing and Application (AcSIR-10-BS-AD-006); Genomics and System Biology (AcSIR-10-BS-AD-007); Principles and Techniques of Plant Molecular Biology (BTB203)

Research Scholars supervised:

- (A) Ph.D. Scholars: total 11 (4 PhD awarded, 2 PhD thesis submitted, 5 ongoing PhD)
(B) Post-doctoral Researchers: total 3

- (C) Project associates (M.Sc./M.Tech.): total 6
(D) Graduate trainees (M.Sc./M.Tech./B.Tech. students): total 20

Awards/Recognitions:

1. Bilateral Exchange Programme-Indian National Science Academy (INSA) and German Research Foundation (DFG) in 2017
2. Young Scientist Award from Council of Scientific and Industrial Research (CSIR), New Delhi in 2015
3. Medal for Young Scientists from Indian National Science Academy (INSA), New Delhi in 2015
4. Innovative Young Biotechnologist Award (IYBA) from Department of Biotechnology (DBT), New Delhi in 2015
5. Young Scientist Platinum Jubilee Award from National Academy of Sciences, India (NASI), Allahabad in 2014
6. The National Eligibility Test (NET) in Crop Improvement in 2009
7. Recognition for the first position in Ph.D. course work examination in 2006
8. CSIR Senior Research Fellow 2006
9. CSIR Junior Research Fellow 2004
10. Merit certificate for obtaining the highest overall grade point average in the M.Sc. (Ag.) in Genetics in 2003
11. The National Eligibility Test (NET) in Life Sciences 2003
12. 23rd rank in all India combined examination for Junior Research Fellowship 2002
13. Featured in the top 2% list of researchers around the world for 2022. Study contributor: John P.A. Ioannidis, Stanford University, Stanford CA, USA.

Research grants received as Principal Investigator:

1. 2022-24: CSIR FIRST project.
2. 2020-23 SERB core research grant.
3. 2019-22: DBT (NER-BPMC) funded multi-institutional project.
4. 2016-21: CSIR Young Scientist Project.
5. 2018-20: CSIR FBR project.
6. 2016-19: INSA young scientist project.
7. 2015-18: DBT IYBA project.
8. 2012-15: SERB-DST Young Scientist Project.

Published research articles (*marks corresponding author; #marks equal contribution; journal impact factors are as per Clarivate 2022):

Publications as corresponding author:

1. Dinday S, Ghosh S* (2023). Recent advances in triterpenoid pathway elucidation and engineering. ***Biotechnology Advances***. 68:108214. **Impact Factor: 17.681**
2. Ghosh S* (2023) Enantioselective terpene emission signifies forest climate response mechanism. ***Trends in Plant Science***. S1360-1385(23)00026-2. **Impact Factor: 22.01.**
3. Srivastava P, Garg A, Misra RC, Chanotiya CS, Ghosh S* (2021) UGT86C11 is a novel plant UDP-glycosyltransferase involved in labdane diterpene biosynthesis. ***Journal of Biological Chemistry***. 297(3):101045. **Impact Factor: 5.157.**
4. Kumar A, Srivastava P, Srivastava G, Sandeep, Kumar N, Chanotiya CS, Ghosh S* (2021) BAHD acetyltransferase contributes to wound-induced biosynthesis of oleo-gum resin triterpenes in *Boswellia*. ***The Plant Journal***. 107(5):1403-1419. **Impact Factor: 6.417.**
5. Garg A, Sharma S, Srivastava P, Ghosh S* (2021) Application of virus-induced gene silencing in *Andrographis paniculata*, an economically important medicinal plant. ***Protoplasma***. 258(5):1155-1162. **Impact Factor: 3.356.**

6. Srivastava G, Sandeep, Garg A, Misra RC, Chanotiya CS, **Ghosh S*** (2020) Transcriptome analysis and functional characterization of oxidosqualene cyclases of the arjuna triterpene saponin pathway. **Plant Science**. 292:110382. **Impact Factor: 4.729**.
7. Sandeep, Misra RC, Chanotiya CS, Mukhopadhyay P, **Ghosh S*** (2019) Oxidosqualene cyclase and CYP716 enzymes contribute to triterpene structural diversity in the medicinal tree banaba. **New Phytologist**. 222(1):408-424. **Impact Factor: 10.151**.
8. Misra RC, Sharma S, Sandeep, Garg A, Chanotiya CS and **Ghosh S*** (2017) Two CYP716A subfamily cytochrome P450 monooxygenases of sweet basil play similar but nonredundant roles in ursane- and oleanane-type pentacyclic triterpene biosynthesis. **New Phytologist**, 214(2):706-720. **Impact Factor: 10.151**.
9. **Ghosh S*** (2017) Triterpene structural diversification by plant cytochrome P450 enzymes. **Frontiers in Plant Science**, 8:1886. **Impact Factor: 5.753**.
10. **Ghosh S*** (2016) Biosynthesis of structurally diverse triterpenes in plants: the role of oxidosqualene cyclases. **Proceedings of the Indian National Science Academy**, 82: 1189–1210 (invited review article).
11. Misra RC, Sandeep, Kamthan M, Kumar S, **Ghosh S*** (2016) A thaumatin-like protein of *Ocimum basilicum* confers tolerance to fungal pathogen and abiotic stress in transgenic Arabidopsis. **Scientific Reports**, 6:25340. **Impact Factor: 4.379**.
12. Misra RC, Garg A, Roy R, **Vasudev PG**, Chanotiya CS and **Ghosh S*** (2015) Involvement of an ent-copalyl diphosphate synthase in tissue-specific accumulation of specialized diterpenes in *Andrographis paniculata*. **Plant Science**, 240:50-64. **Impact Factor: 4.729**.
13. Garg A, Agrawal L, Misra RC, Sharma S, and **Ghosh S*** (2015) *Andrographis paniculata* transcriptome provides molecular insights into tissue-specific accumulation of medicinal diterpenes. **BMC Genomics**, 16:659. **Impact Factor: 3.969**.
14. Misra RC, Maiti P, Chanotiya CS, Shanker K and **Ghosh S*** (2014) Methyl jasmonate-elicited transcriptional responses and pentacyclic triterpene biosynthesis in sweet basil. **Plant Physiology**, 164(2):1028-1044. **Impact Factor: 8.340**.

Publications as first author:

15. Irfan M[#], **Ghosh S[#]**, Kumar V, Chakraborty N, Chakraborty S, Datta A (2014) Insights into transcriptional regulation of β -D-N-acetylhexosaminidase, an N-glycan-processing enzyme involved in ripening-associated fruit softening. **Journal of Experimental Botany**, 65(20):5835-48. **Impact factor: 6.992**.
16. **Ghosh S[#]**, Singh UK[#], Meli VS[#], Kumar V, Kumar A, Irfan M, Chakraborty N, Chakraborty S and Datta A (2013) Induction of senescence and identification of differentially expressed genes in tomato in response to monoterpene. **PLoS ONE**, 8(9):e76029. **Impact factor: 3.240**.
17. **Ghosh S[#]**, Meli VS[#], Kumar A, Thakur A, Chakraborty N, Chakraborty S and Datta A (2011) The N-glycan processing enzymes α -mannosidase and β -D-N-acetylhexosaminidase are involved in ripening-associated softening in the non-climacteric fruits of capsicum. **Journal of Experimental Botany**, 62(2):571-82. **Impact factor: 6.992**.
18. Meli VS[#], **Ghosh S[#]**, Prabha TN, Chakraborty N, Chakraborty S and Datta A (2010) Enhancement of fruit shelf life by suppressing N-glycan processing enzymes. **Proceedings of the National Academy of Sciences, USA**, 107(6):2413-8. **Impact factor: 11.205**

Publications as contributing author:

19. Bhatt DN, Ansari S, Kumar A, **Ghosh S**, Narula A, Datta A (2020) *Magnaporthe oryzae* MoNdt80 is a transcriptional regulator of GlcNAc catabolic pathway involved in pathogenesis. **Microbiological Research**, 239:126550. **Impact factor: 5.415**.
20. Singh S, Pandey P, **Ghosh S**, Banerjee S (2018) Anti-cancer labdane diterpenoids from adventitious roots of *Andrographis paniculata*: augmentation of production prospect endowed with pathway gene expression. **Protoplasma**, 255(5):1387-1400. **Impact factor: 3.356**.
21. Khan S, Upadhyay S, Khan F, Tandon S, Shukla RK, **Ghosh S**, Gupta V, Banerjee S, Ur Rahman L (2017) Comparative transcriptome analysis reveals candidate genes for the biosynthesis of natural insecticide in *Tanacetum cinerariifolium*. **BMC Genomics**, 18(1):54. **Impact factor: 3.969**.

22. Kumar A, **Ghosh S**, Bhatt DN, Narula A, Datta A (2016) *Magnaporthe oryzae* aminosugar metabolism is essential for successful host colonization. ***Environmental Microbiology***, 18(3):1063-77. **Impact factor: 5.491.**
23. Kumar V, Chattopadhyay A, **Ghosh S**, Irfan M, Chakraborty N, Chakraborty S, Datta A (2016). Improving nutritional quality and fungal tolerance in soya bean and grass pea by expressing an oxalate decarboxylase. ***Plant Biotechnology Journal***, 14(6):1394-405. **Impact factor: 9.803.**
24. Kumar V, Irfan M, **Ghosh S**, Chakraborty N, Chakraborty S, Datta A (2016) Fruit ripening mutants reveal cell metabolism and redox state during ripening. ***Protoplasma***, 253(2):581-94. **Impact factor: 3.356.**
25. Maiti P, Ghorai P, **Ghosh S**, Kamthan M, Tyagi RK, Datta A (2015) Mapping of functional domains and characterization of the transcription factor Acpr/Cph1 that mediate morphogenesis in *Candida albicans*. ***Fungal Genetics and Biology***, 83:45-57. **Impact factor: 3.495.**
26. Irfan M, **Ghosh S**, Meli VS, Kumar A, Kumar V, Chakraborty N, Chakraborty S, Datta A (2014) Fruit ripening regulation of α -mannosidase expression by the MADS Box transcription factor RIPENING INHIBITOR and ethylene. ***Frontiers in Plant Science***, 7:10. **Impact factor: 5.753.**
27. Rastogi S, Meena S, Bhattacharya A, **Ghosh S**, Shukla RK, Sangwan NS, Lal RK, Gupta MM, Lavania UC, Gupta V, Nagegowda DA and Shasany AK (2014) De novo sequencing and comparative analysis of holy and sweet basil transcriptomes. ***BMC Genomics***, 15:588. **Impact factor: 3.969.**
28. Verma P, Khan SA, Mathur AK, **Ghosh S**, Shanker K, Kalra A (2014) Improved sanguinarine production via biotic and abiotic elicitations and precursor feeding in cell suspensions of latex-less variety of *Papaver somniferum* with their gene expression studies and upscaling in bioreactor. ***Protoplasma***, 251(6):1359-71. **Impact factor: 3.356.**

Patents granted:

1. Polynucleotide sequence of fruit softening associated β -D-N-acetylhexosaminidase and its uses for enhancing fruit shelf life (PCT/IN2009/000388). Datta A, Chakraborty S, Chakraborty N, Meli VS, **Ghosh S**. Patent granted in US (US8987556 B2) and Europe (EP2315830 B1).
2. Recombinant microorganisms and uses thereof. Datta A, **Ghosh S**, Ghosh S, Rao HK, Mohan K. Patent granted in US (US 8734814 B2).
3. Polynucleotide sequence of fruit softening associated α -mannosidase and its uses for enhancing fruit shelf life (PCT/IN2009/000387). Datta A, Chakraborty S, Chakraborty N, **Ghosh S**, Meli VS. Patent granted in US (US8962918 B2) and Europe (EP2315835 B1).

Patent filed:

1. Genetically engineered yeasts and use thereof for de novo production of enantiopure germacrene D. **Ghosh S**, Sharma S, Chaurasia S, Sandeep, Srivastava G, Singh A, Chanotiya CS. Patent application filed in India (Application No. 202311037138, dated 29.05.23)

Book Chapters:

1. Misra RC, Sharma S, Garg A and **Ghosh S*** (2020) Virus Induced Gene Silencing in Sweet basil (*Ocimum basilicum*). In: Virus Induced Gene Silencing in Plants: Methods and Protocols. Eds: Courdavault V, Besseau S. Methods in Molecular Biology, Springer. 172:123-138. doi: 10.1007/978-1-0716-0751-0_10.
2. Sandeep and **Ghosh S*** (2020) Triterpenoids: structural diversity, biosynthetic pathway and bioactivity. In: Studies in Natural Products Chemistry. Ed: Atta-ur-Rahman. Elsevier. Volume 67, Pages 411-461.
3. **Ghosh S*** (2018) Triterpene Functional Genomics in Ocimum. In: The Ocimum Genome. Eds: Ajit K. Shasany, Chittaranjan Kole. Springer, Cham, Page 111-126.
4. **Ghosh S**, Irfan M and Datta A (2017) Improving Industrial Traits through RNA Silencing. In Plant Gene Silencing: Mechanisms and Applications. Ed: Dalmay Tamas. CABI Biotechnology series books, Page 128-146.
5. Datta A and **Ghosh S** (2015) Agricultural Biotechnology for Food Sufficiency and Benefit to Human Health- Chapter No. 72 in Textbook of Biochemistry, Biotechnology, Allied & Molecular Medicine, under Section VIII, Human Genetics, Biochemical Basis of Inheritance, Expression of Genetic Information,

Membership of Learned Society:

Life member of the Society of Biological Chemists (India).

Professional services/activities:

1. **Associate Editor:** Frontiers in Plant Sciences
2. **Reviewer of journal articles:** New Phytologist, Plant Journal, Journal of Experimental Botany, Plant Molecular Biology, Planta, Phytochemistry, Molecular Plant, Plant Physiology and Biochemistry, Frontiers in Plant Science, Journal of Advanced Research, Plos one, Scientific Reports, RNA biology, etc.
3. **Member of the doctoral advisory committee:** CSIR-CIMAP, India and Ashoka University, India
4. **PhD thesis examiner:** IIT Roorkee, BITS Pilani Goa campus, CSIR-IIIM Jammu, Jamia Hamdard, New Delhi
5. **Evaluator of grant proposal:** CSIR, DBT, DST, UP CST, Swiss National Science Foundation

List of selected conference presentations/invited talks:

1. Ghosh S* (2023) The Scope and Future of Synthetic Biology. Organized by iGEM team IISER Tirupati on 26.08.23 (Invited talk)
2. Ghosh S* (2023) Delivered a talk on the topic 'Biotechnological interventions of Medicinal and Aromatic Plants' in the training programme on "Documentation, Good Agricultural Practices, Biotechnological Tools and Techniques, Quality Control, Bioprospection and Product Development of Medicinal and Aromatic Plants Native to the Indian Ocean Region" on 23.03.2023 organized by IORA-RCSTT Coordination Centre on Medicinal Plants (ICOMP), CSIR-CIMAP, Lucknow
3. Ghosh S* (2023) Understanding resin terpene biosynthesis in the medicinal tree *Boswellia*' in a National Conference on 'Medicinal Plants-Frontier Areas of Research and Development' on 17.03.23 organized by Hansraj College, University of Delhi (invited talk).
4. Ghosh S* (2022) Unraveling nature's biochemical factory: the pathway to synthetic biology. Invited popular scientific talk held on Feb 24, 2022 at IIT (BHU), Varanasi on the occasion of 'vigyan sarvatra pujiyate' programme during Feb 22-28, 2022 jointly organised by DST, DBT, CSIR, MoES, DAE, DOS, ICMR, AICTE, and DRDO under the leadership of the Office of the Principal Scientific Adviser to the Government of India and the Ministry of Culture (Invited talk).
5. Ghosh S* (2022) Plant Specialized Metabolism and Metabolic Engineering. In the faculty development program organized by Amity Institute of Biotechnology, Kolkata. 18-22 July, 2022 (Invited talk).
6. Ghosh S* (2022) An integrative approach to understand plant specialized metabolism and metabolic engineering. National Conference on 'Recent Trends in Plant Biology' to be held at Sher-i-Kashmir International Convention Centre, Srinagar, during Sept 5-7, 2022 (Invited talk).
7. Ghosh S* (2021) Innovation & IPR in Biological/ Agricultural Sciences: A Case Study of CRISPR Technology. International Refresher Course on Emerging Jurisprudence of Intellectual Property Rights and Policies: Recent Trends & Challenges Around the Globe, 6-18th September, 2021. Organized by The Neotia University, west Bengal (Invited talk).
8. Ghosh S* (2021) Unraveling the biosynthetic enzymes of medicinal diterpenes in kalmegh. 90th annual meeting of The Society of Biological Chemists (SBCI), India, 16th-19th December, 2021. Organized by Amity University Gurugram (Invited talk).
9. Ghosh S* (2020) Triterpene biosynthesis in medicinal plant: discovery of key enzymes and pathway reconstruction. In: National Conference on Frontiers in Plant Biology held at University of Hyderabad. Page 35 (Invited talk).
10. Ghosh S* (2020) Understanding plant triterpene biosynthesis: key enzymes and pathway reconstruction. In: Current Trends and Challenges in Plant Biochemistry and Biotechnology. BITS Pilani, K. K. Birla Goa Campus and The Society for Plant Biochemistry and Biotechnology. Page 13 (Invited talk).

11. Ghosh S* (2020) Triterpene biosynthesis in plants: identification of key enzymes and pathway reconstruction. International virtual conference on Plant Specialized Metabolism and Metabolic Engineering. CSIR-Central Institute of Medicinal and Aromatic Plants. Page 10 (Invited talk).
12. Ghosh S* (2019) Unraveling triterpene biosynthetic pathway in medicinal plants: enzyme discovery to metabolic engineering. Ashoka University, Haryana (Invited talk).
13. Sandeep, Misra RC, Chanotiya CS, Mukhopadhyay P and Ghosh S* (2018) An integrative approach to understand triterpene biosynthesis in medicinal tree. In: 4th International Plant Physiology Congress held at Lucknow. Page 50 (Invited talk).
14. Misra RC, Sharma S, Sandeep, Garg A, Chanotiya CS and Ghosh S* (2017) Sweet basil cytochrome P450 monooxygenases CYP716A252 and CYP716A253 participate in spatio-temporal accumulation of bioactive ursane- and oleanane-type pentacyclic triterpenes. In: National Symposium on Plant Biotechnology: Current Perspectives on Medicinal and Crop Plants held at CSIR-IICB, Kolkata. Page 57 (talk).
15. Ghosh S* (2013) Biotechnological approaches to improve postharvest stability of fruits and vegetable. In: DBT-Sponsored Brainstorming Session Postharvest Stability of Farm Produce held at National Agri-Food Biotechnology Institute, Mohali (Invited talk).