

## **Dr. Subha Narayan Das**

*Assistant Professor*

*Department of Botany*

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### **Research Interest**

My research laboratory focuses on plant-microbe interactions with the long-term goal of developing sustainable agricultural practices through the use of beneficial microbes and their associated enzymes. We aim to understand how stress conditions alter the phytobiome of crops, and to identify plant growth-promoting (PGP) bacteria from a variety of plant sources, including crops, medicinal plants, and weeds. The lab is also interested in the discovery and characterization of novel chitin-degrading and chitin-modifying enzymes. These enzymes are explored for their potential applications in synthesizing chitooligosaccharides (COS), which play a role in boosting plant immunity.

To achieve our research goals, we adopt an integrated approach that combines microbiological, molecular, and biochemical techniques, along with plant growth promotion and disease suppression assays.

### **Professional and Academic details**

- Assistant Professor (Senior Scale, June 2017 - Present)
- UGC-NET, CSIR-SRF, ICAR-NET
- Post-doctoral Research Associate (2016 - 2017) sponsored by European Union (EU)
- Ph.D. in Plant Sciences (2010 - 2016), University of Hyderabad
- M.Sc. in Plant Sciences, University of Hyderabad
- B.Sc. (Hons.) in Botany, OUAT, Bhubaneswar
- Total no. of publications: 23
- Patent - 01

### **Teaching Responsibilities & Research Guidance/Research Projects**

- Teaching Experience: From June 2017 - continuing at UG- and PG-level)
- Papers in UG: Microbial diversity, Biofertilizer, Plant anatomy, Plant pathology, Molecular biology, Plant Physiology & metabolism, Bioinformatics
- Papers in PG: Plant Biochemistry, Microbiology, Mycology & plant pathology, Bioinformatics
- Paper in Ph.D. coursework: Research methodology
- **No. of Ph.D. supervised: Awarded – 01, Ongoing – 04**

- **M.Sc. Dissertation(s) guided: 22**
- **Research projects: Completed – 02, Ongoing – 01**

S. No.	Title of the Project	Role	Funding Agency	Duration	Amount (Lakh)
1	National Network Project of North Eastern Hill University, Shillong.	PI	DBT, New Delhi	2024-2029 (Ongoing)	38.22
2	Dynamics of soil CO <sub>2</sub> and NO <sub>x</sub> effluxes by invasive plants species: implications for accelerated climate change in tropical deciduous forests of Central India.	Co-PI	DST-SERB, New Delhi	2021-2024 (Completed)	46.34
3	Characterization of efficient chitinolytic plant growth rhizobacteria and chitinases for their application in plant strengthening activities.	PI	UGC Start-Up, New Delhi	2018 – 2020 (Completed)	10

### Awards/Recognition/Fellowships

- **Research appreciation award** by IGNTU, January 26, 2025
- **Marshall Award** for contribution in the area of “Application of Chitin and Chitosan in Biotechnology/Enzymology/Agriculture Application” at 11<sup>th</sup> Asia Pacific Chitin and Chitosan Symposium 2016
- **Best Ph.D. thesis award** for the year 2016 by the Department of Plant Sciences, University of Hyderabad
- Travel award from **DST-SERB** (2015) for attending 12<sup>th</sup> International Conference of the European Chitin Society/13<sup>th</sup> International Conference on Chitin and Chitosan (EUCHIS/ICCC 2015) held at Muenster, Germany
- **DFG fellowship** for research stay at University of Muenster, Germany (Aug–Dec, 2014)
- **DFG fellowship** for research stay at University of Muenster, Germany (Aug–Dec, 2013)

### Invited Talks/Resource Person

- **Invited lecture** in a National conference on the topic entitled “Decoding the sugar code: chitosans structure and their priming activity in plant” held at CTUAP, Vizianagaram, February 28, 2025
- **Invited lecture** in an International conference on the topic entitled “Chitin and chitosan degrading enzymes of *Paenibacillus elgii*: functional characterization, specificity and applications” held at University of Hyderabad, February 2, 2025
- Lecture as a **Resource person** on the topic entitled “Plant Immunity - How Plants Defend Themselves” at Bhavan's Vivekananda College, Osmania University, November 2023
- **Paper presentation** at 7<sup>th</sup> Indian Chitin and Chitosan Society Conference, NCL, Pune, October 2018
- **Invited lecture** in a National conference on Molecular intricacies of plant microbe interactions, IGNTU, October 2017.
- **Paper presentation** at National conference of Indian Chitin and Chitosan Society, Kochi, September 2016

## List of Publications

1. Yadav, S., Singh, A., Mohan, M., **Das, S. N.**, Rai, M. K. (2025). In vitro propagation, phytochemical analysis and assessment of antioxidative potential of micropropagated plants of *Tecoma capensis* (Thumb.) Spach. *South African Journal of Botany* (Accepted for publication). (IF-2.7)
2. Prasad, P., Mansoori, A., Prajapati, N., Tripathi, J., Sharma, K., Kumar, A., & **Das, S. N.** (2024). Phytochemical screening and antimicrobial activities of *Guizotia abyssinica* L. leaf and flower extracts. *Journal of Natural Pesticide Research*, 9, 100083. <https://doi.org/10.1016/j.napere.2024.100083>. (IF- 0.6)
3. Prasad, P., Kalam, S., Sharma, N. K., Podile, A. R., & **Das, S. N.** (2022). Phosphate solubilization and plant growth promotion by two *Pantoea* strains isolated from the flowers of *Hedychium coronarium* L. *Frontiers in Agronomy*, 4, 990869. <https://doi.org/10.3389/fagro.2022.990869>. (IF-4.1)
4. Singh P, Singh KRB, Verma R, Prasad P, Verma R, **Das SN**, Singh J, Singh RP (2022). Preparation, antibacterial activity, and electrocatalytic detection of hydrazine based on biogenic CuFeO<sub>2</sub>/PANI nanocomposites synthesized using *Aloe barbadensis* Miller. *New Journal of Chemistry*. 46(18):8805-16. <https://doi.org/10.1039/D2NJ00913G>. (IF-2.5)
5. Singh P, Singh KRB, Singh J, **Das SN**, Singh RP (2021). Tunable electrochemistry and efficient antibacterial activity of plant-mediated copper oxide nanoparticles synthesized by *Annona squamosa* seed extract for agricultural utility. *RSC Advances*, 11, 18050. <https://doi.org/10.1039/D1RA02382A>. (IF-4.6)
6. Basu A, Prasad P, **Das SN**, Kalam S, Sayyed RZ, Reddy MS, El Enshasy H (2021). Plant Growth Promoting Rhizobacteria (PGPR) as Green Bioinoculants: Recent Developments, Constraints, and Prospects. *Sustainability*, 13(3), 1140. <https://doi.org/10.3390/su13031140>. (IF-3.3)
7. Mansoori A, Singh N, Dubey SK, Thakur TK, Alkan N, **Das SN**, Kumar A (2020). Phytochemical characterization and assessment of crude extracts from *Lantana camara* L. for antioxidant and antimicrobial activity. *Frontiers in Agronomy*, [doi.org/10.3389/fagro.2020.582268](https://doi.org/10.3389/fagro.2020.582268). (IF-4.1)
8. Kumar A, Kumar R, Sengupta D, **Das SN**, Pandey MK, Bohra A, Sharma NK, Sinha P, Masood HS, Ghazi IA, Laha GS, Sundaram RM (2020). Deployment of genetic and genomic tools towards gaining a better understanding of Rice-Xanthomonas oryzae pv. oryzae interactions for development of durable bacterial blight resistant rice. *Frontiers in Plant Science*. *Frontiers in Plant Science*, [doi.org/10.3389/fpls.2020.01152](https://doi.org/10.3389/fpls.2020.01152). (IF-4.8)
9. Sivaramakrishna D, Bhuvanachandra B, Mallakuntla MK, **Das SN**, Ramakrishna B, Podile AR (2020). Pretreatment with KOH and KOH-urea enhanced hydrolysis of  $\alpha$ -chitin by an endo-chitinase from *Enterobacter cloacae* subsp. *cloacae*. *Carbohydrate Polymers*, 8:115952, [doi.org/10.1016/j.carbpol.2020.115952](https://doi.org/10.1016/j.carbpol.2020.115952). (IF-12.5)
10. Basa S, Nampally M, Honorato T, **Das SN**, Podile AR, El Gueddari NE, Moerschbacher BM (2020). The pattern of acetylation defines the priming activity of chitosan tetramers. *Journal of American Chemical Society (JACS)*, 142, 4: 1975-1986. [doi.org/10.1021/jacs.9b11466](https://doi.org/10.1021/jacs.9b11466). (IF-15.6)
11. Vaikuntapu PR, Mallakuntla MK, **Das SN**, Bhoopal B, Bellamkonda R, Nadendla SR, Podile AR (2018). Applicability of endochitinase of *Flavobacterium johnsoniae* with transglycosylation activity in generating long-chain chitooligosaccharides. *International Journal of Biological Macromolecules*, 117: 62-71. [doi.org/10.1016/j.ijbiomac.2018.05.129](https://doi.org/10.1016/j.ijbiomac.2018.05.129). (IF-8.5)
12. Mohan Krishna M, Papa Rao V, Bhuvanachandra B, **Das SN**, Podile AR (2017). Bioconversion of chitinous substrates to long chain chitooligosaccharides by a transglycosylating chitinase from *Enterobacter cloacae* sub sp. *cloacae*. *Scientific Reports*, Doi: [10.1038/s41598-017-05140-3](https://doi.org/10.1038/s41598-017-05140-3). (IF-3.9)
13. Kalam S, **Das SN**, Basu A, Podile AR (2017). Population densities of indigenous *Acidobacteria* change in the presence of plant growth promoting rhizobacteria (PGPR) in rhizosphere. *Journal of Basic Microbiology*. 57: 376-385. Doi: <https://doi.org/10.1002/jobm.201600588>. (IF-2.7)
14. **Das SN**, Wagenknecht M, Nareddy PK, Bhuvanachandra B, Niddana R, Balamurugan R, Swamy MJ, Moerschbacher BM, Podile AR (2016). Amino groups of chitosan are crucial for binding to a family 32 carbohydrate binding module of a chitosanase from *Paenibacillus elgii*. *Journal of Biological Chemistry*, 291:18977-18990. Doi: [10.1074/jbc.M116.721332](https://doi.org/10.1074/jbc.M116.721332). (IF-5.1)

15. **Das SN**, Madhuprakash J, Sarma PVSRN, Purushotham P, Suma K, Manjeet K, Rambabu S, El Gueddari NE, Moerschbacher BM, Podile AR (2015). Biotechnological approaches for field applications of chitooligosaccharides (COS) to induce innate immunity in plants. *Critical Reviews in Biotechnology*, 35: 29-43. DOI: [10.3109/07388551.2013.798255](https://doi.org/10.3109/07388551.2013.798255). (IF-8.4)
16. Anil K, **Das SN**, Podile AR (2014). Induced defense in plants: A short overview. *Proceedings of the National Academy of Sciences, India Section B: Biological Sciences*. 84: 669-679. <https://doi.org/10.1007/s40011-013-0279-2>. (IF-1.2)
17. **Das SN**, Sarma PVSRN, Neeraja Ch, Malati N, Podile AR (2010) Members of *Gammaproteobacteria* and *Bacilli* represent the culturable diversity of chitinolytic bacteria from chitin-enriched soils. *World Journal of Microbiology and Biotechnology*, 26: 1875-1881. [doi.org/10.1007/s11274-010-0369-8](https://doi.org/10.1007/s11274-010-0369-8). (IF-4.2)
18. **Das SN**, Dutta S, Anil K, Neeraja Ch, Sarma PVSRN, Srinivas V, Podile AR (2010). Plant growth promoting chitinolytic *Paenibacillus elgii* responds positively to the tobacco root exudates. *Journal of Plant Growth Regulation*, 29: 409-418. [doi.org/10.1007/s00344-010-9152-1](https://doi.org/10.1007/s00344-010-9152-1). (IF-4.4)

#### **Book chapters**

19. Podile AR, **Das SN**, Madhuprakash J, Sarma PVSRN (2013). Transglycosylation mediated synthesis of chitooligosaccharides and scope of application. In: Deshpande MV, Ruiz-Herrera J (Eds.), *Biotechnology: Beyond Borders*. NCL, Pune, India, pp 348-364.
20. Sarma PVSRN, Madhuprakash J, **Das SN**, Kaur M, Purushotham P, Podile AR (2013). Microbial chitinases: Natural sources, mutagenesis and directed evolution to obtain thermostable counterparts. Satyanarayana T, Littlechild J, Kawarabayasi Y (Eds.), *Thermophilic Microbes in Environmental and Industrial Biotechnology*. Springer Inc, Netherlands, pp 649-669.
21. **Das SN**, Neeraja Ch, Sarma PVSRN, Madhuprakash J, Purushotham P, Podile AR (2012). Exploitation of chitinolytic potential of microbial chitinases for chitin waste management. In: Satyanarayana T, Johri BN, Prakash A (Eds.), *Microorganisms in Environmental Management*. Springer Inc, Netherlands, pp 135-150.
22. **Das SN**, Madhuprakash J, Podile AR (2012). Elicitor active molecules from fungal cell wall. In: Chowdappa P (Ed), *Molecular Approaches for Plant Fungal Disease Management*. Westville Pub, New Delhi, India.
23. Podile AR, Purushotham P, **Das SN**, Sarma PVSRN, Madhuprakash J (2012). Chitin, chitosan and chitooligosaccharides: a treasure in store. In: Ramreddy S, Singaracharya MA, Girisham S (Eds.), *Microbial Diversity Exploration and Bioprospecting*. Scientific Publishers, India, pp 309-324.

#### **Administrative/Co-curricular Responsibilities**

- IQAC Departmental Coordinator, IGNTU (2025)
- Member of Drafting Committee for 'Waste Management Guidelines of IGNTU' 2025
- Member of Board of Studies (BoS), Dept. of Botany, IGNTU, 2024
- Various academic and administrative committees of IGNTU since 2017