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Bose Institute
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Education and Research

May 2023-Till date
Associate Professor, Department of Biological Sciences, Bose Institute, Kolkata, India

2020-May 2023
Associate Professor, Division of Plant Biology, Bose Institute, Kolkata, India

2016-2020
Assistant Professor, Division of Plant Biology, Bose Institute, Kolkata, India

2013-2018
DST INSPIRE Faculty, Division of Plant Biology, Bose Institute, Kolkata, India

2010-2013
Post Doctoral Research, Department of Organismic Interaction, Max Planck Institute for Terrestrial Microbiology, Marburg, Germany

2005-2010
PhD in Biotechnology, University of Calcutta, India

2003-2005
M.Sc in Biotechnology, University of Calcutta, India

2000-2003
B.Sc (Hons) in Microbiology, University of Calcutta, India

Awards and Fellowships

1. **Fulbright-Nehru Academic and Professional Excellence Fellowship,** Fulbright Association & United States India Educational Foundation (USIEF), 2023, 2024
2. **Early Career Research Award,** Science and Engineering Research Board (SERB), India (2018).
3. **DST-INSPIRE Faculty Award,** Department of Science and Technology (DST), India (2013).
4. **Max Planck Postdoctoral Fellowship** (2010-2013).
5. Qualified in the **National Eligibility Test,** NET (2005) jointly conducted by UGC and CSIR

6. Qualified in the **Graduate Aptitude Test in Engineering**, GATE (2005)
7. **Summer Research Fellowship** from Indian Academy of Science, Bangalore (2004)

Publications

Research articles in peer-reviewed journal:

1. Mitra A, Bhakta K, Kar A, Roy A, Mohid Sk A, Ghosh A, **Ghosh A*.** Insight into the biochemical and cell biological function of an intrinsically unstructured heat shock protein, Hsp12 of *Ustilago maydis*. Molecular Plant Pathology 2023, doi: 10.1111/mpp.13350.
2. Mukherjee S, Bhakta K, Ghosh A, **Ghosh A***. Ger1 is a secreted aspartic acid protease essential for spore germination in *Ustilago maydis* Yeast 2022, doi: 10.1002/yea.3835.
3. Acharya U, Das T, Ghosh Z and **Ghosh A***. Defense surveillance system at the interface: esponse of rice towards *Rhizoctonia solani* during sheath blight infection. Molecular Plant Microbe Interactions, 2022, Vol 35(12), 1081-1095, doi: 10.1094/MPMI-07-22-0153-R.
4.Mukherjee D, Singh N P, Roy A, Mondal R, Acharya U, Chattopadhyay D, **Ghosh A***. The extracellular RNA pool within Zea mays apoplast: composition and differential expression during *Ustilago maydis* infection. BioRxiv 2022, doi: 10.1101/2022.06.03.494492.
5. Roy M, Bhakta K, Bhowmick A, Gupta S, **Ghosh A**, Ghosh A. Archaeal HSP14 drives substrate shuttling between small heat shock proteins and thermosome: insights into a novel substrate transfer pathway. FEBS Journal 2022, Vol 289 (4), 1080-1104, doi: 10.1111/febs.16226. Epub 2021 Oct 24.
6. Bhattacharya C, Banerjee S, Acharya U, Mitra A, Mallick I, Haldar A, Haldar S, **GhoshA**, Ghosh A. Evaluation of plant growth promotion properties and induction of antioxidative defense mechanism by tea rhizobacteria of Darjeeling, India. Scientific Reports 2020, Vol 10 (1), 1-19, doi: 10.1038/s41598-020-72439-z.
7. Mukherjee D, Gupta S, GhoshA, **Ghosh A***. Ustilago maydis secreted T2 ribonucleases, Nuc1 and Nuc2 scavenge extracellular RNA. Cellular Microbiology 2020, Vol 22 (12), doi: 10.1111/cmi.13256.
8. Mukherjee D, Mitra A, **Ghosh A***. Detection of apoptosis like cell death in *Ustilago maydis* by Annexin V-FITC staining. Bioprotocol 2018, Vol 8 (15), doi:10.21769/BioProtoc.2948.
9. Mukherjee D, Gupta S, Saran N, Datta R, **Ghosh A***. Induction of apoptosis-like cell death and clearance of stress induced intracellular protein aggregates: dual roles for Ustilago maydis metacaspase Mca1. Molecular Microbiology 2017, Sep 23, doi: 10.1111/mmi.13848.
10. Ghosh P, Roy A, Hess D, **Ghosh A**, Das S. Deciphering the Mode of Action of a Modified Allium sativum Leaf Agglutinin (mASAL), a Potent antifungal Protein on *Rhizoctonia solani*. BMC Microbiology 2015; Oct 26;15:237.
11. **Ghosh A***, Raha S. Molecular and functional characterization of a stress responsive cysteine protease, EhCP6 from Entamoeba histolytica. Protein Expression and Purification 2015 May;109:55-61. doi: 10.1016/j.pep.2015.02.005.
12. **Ghosh A***. Small heat shock proteins (HSP12, HSP20 and HSP30) play a role in *Ustilago maydis* pathogenesis. FEMS Microbiology Letters 2014 Sep 22; doi: 10.1111/1574-6968.12605
13. Djamei A£, Schipper K£, Rabe F, **Ghosh A**, Vincon V, Kahnt J, Osorio S, Tohge T, Fernie AR, Feussner I, Feussner K, Meinicke P, Stierhof YD, Schwarz H, Macek B, Mann M, Kahmann R. Metabolic priming by a secreted fungal effector. Nature 2011 Oct 5; 478(7369): 395-8. doi: 10.1038/nature10454.
14. **Ghosh AS**, Ray D, Dutta S, Raha S. EhMAPK, the mitogen-activated protein kinase from

Entamoeba histolytica is associated with cell survival. PLoS One 2010 Oct 8; 5(10): e13291. doi: 10.1371/journal.pone.0013291.
15. **Ghosh AS**, Dutta S, Raha S. Hydrogen peroxide-induced apoptosis-like cell death in Entamoeba histolytica. Parasitology International 2010 Jun; 59(2): 166-72. doi: 10.1016/j.parint.2010.01.001. Epub 2010 Jan 15.
16. Dutta S, **Sardar A**, Ray D, Raha S. Molecular and functional characterization of EhPAK3 a p21 activated kinase from Entamoeba histolytica. Gene 2007 Nov 1;402 (1-2):57-67.

Book chapters

1. Bhattacharyya, C, Roy, R, Tribedi, P, **Ghosh, A**, Ghosh, A. (2020) Biofertilizers as substitute to commercial agrochemicals. M.N.V Prasad (Eds.), Agrochemicals Detection, Treatment and Remediation, Pesticides and Chemical Fertilizers, February 2020, 11: 263-290 (ISBN 978-0-08-103017-2). https://doi.org/10.1016/C2018-0-02947-3
2. Mallick, I, **Ghosh, A**, Ghosh, A. (2019) Microbe-Mediated Removal of Heavy Metals for Sustainable Agricultural Practices. In: B. Giri et al. (eds.), Biofertilizers for Sustainable Agriculture and Environment, Soil Biology, August 2019, 55: 521-544 (ISBN 978-3-030-18932-7). https://link.springer.com/chapter/10.1007/978-3-030-18933-4_24
3. **Ghosh A***, Raha S. (2017) Proteases from protozoa and their role in infection. In: **Chakraborti,** Sajal, **Dhalla**, Naranjan S. (eds.), Proteases in physiology and pathology. September 2017 Springer, Singapore (ISBN 978-981-10-2513-6). https://link.springer.com/chapter/10.1007/978-981-10-2513-6_8
4. Ray D, **Ghosh A**, Banerjee Mustafi S, Raha S. (2016) Plant stress response: HSP70 in the spotlight. In: Asea A., Kaur P., Calderwood S. (eds), Heat Shock Proteins and Plants. Heat Shock Proteins, vol 10. November 2016 Springer, Cham (ISBN 978-3-319-46340-7) https://link.springer.com/chapter/10.1007/978-3-319-46340-7_7

Conference proceedings

1. R. Datta, A. Kumari, S. N., U. Acharya, S. Saha, **A. Ghosh** (2019) An insight into the apoplast of rice during Rhizoctonia solani AG1-IA infection. Molecular Plant-Microbe Interactions 32:S1.106. https://doi.org/10.1094/MPMI-32- 10-S1.106
2. **A. Ghosh**, S. Dutta, D. Ray and S. Raha (2009) Molecular mechanisms of stress response in the parasitic protozoan Entamoeba histolytica, International Journal of Medical Microbiology. Volume 299, Supplement 1, September 2009. doi:10.1016/j.ijmm.2009.08.001
3. **A. Sardar**, S. Dutta, D. Ray and S. Raha (2007) Survival and death of Entamoeba histolytica under conditions of stress. Tropical Medicine and International Health 12 (suppl 1) p30, doi: 10.1111/j.1365-3156.2007.01866.x

***Author for correspondence**

CONFERENCES & WORKSHOPS ATTENDED/ORGANISED

***Delivered lectures*:**

1. 16th – 17th March 2023: Delivered a talk entitled 'Insights into the physiological roles of small heat shock proteins in a biotrophic plant pathogen *Ustilago maydis*' in National Seminar on New Horizons in Biotechnology (NHBT 2023) held at Haldia Institute of Technology.
2. 10th – 13th March 2023: Delivered a talk on 'Insights into the physiological role of an intrinsically disordered small heat shock protein Hsp12' in the Yeast India 2023, fundamentals to application of yeast and fungi held at IISER Mohali.
3. 4th – 6th November 2022: Delivered a talk on 'Small heat shock proteins play key role in framing the morphological development in *Ustilago maydis*' in the 4th Biological Society Engineering Confernce BESCON 2022 held at Bose Institute, Kolkata.
4. 14th -15th February 2020: Presented progress of the research project entitled 'Evaluation of secreted proteases of Ustilago maydis as potential effector proteins.' in a SERB sponsored Group Montoring Workshop at BITS Pilani, Hyderabad Campus.
5. 8th -11th February 2018: Delivered a talk entitled ' Stress response in *Ustilago maydis*: Insights to in planta survival of the pathogen.' in 10th Conference on Yeast Biology: Model Yeasts to Fungal Pathogens at JNU, New Delhi and Amity University Gurgaon.
6. 29th -31st January 2018: Delivered a talk entitled ' Clearance of intracellular insoluble protein aggregates: an unconventional role for *U. maydis* metacaspase, Mca1' in 18th All India Congress of Cytology and Genetics and International Symposium on Translating Genes and Genomes at CSIR-IICB.
7. 31st July 2015: Delivered a talk entitled 'Molecular strategies for establishing biotrophy by *Ustilago maydis*' at the One day symposium on "Recent advances in Biotechnology" jointly organised by Department of Biotechnology, Visva Bharati University and The "Rural Biotechnology" program of DBT" held at Lipika auditorium, Visva Bharati.
8. 12th-17th March 2013: Delivered a talk entitled 'Domains for plant uptake of Ustilago maydis secreted effectors' at the 27th Fungal Genetics Conference organized by Genetics Society of America held at Asilomar Conference Ground, Pacific Grove, California.
9. 11 June 2010: Presented a talk entitled 'Stress Response in the Parasitic Protozoan Entamoeba histolytica' at the one day symposium on Current Trends in Biological Sciences organized by the Society of Biological Chemists, Kolkata Chapter, India at the Department of Biochemistry, University of Calcutta, India.
10. 20-23 September 2009: Presented a talk entitled 'Molecular Mechanisms of Stress Response in the Parasitic Protozoan Entamoeba histolytica' at the 61st Annual Meeting of the German Society for Hygiene and Microbiology held at George August University, Goettingen, Germany.

Participated/presented poster

1. 10th -12th May 2023: Participated in the pre-departure orientation (PDO) program for the Indian Fulbright grantees as an FNAPE awardee in the 'The Westin' Rajarhat, Kolkata.
2. 13th -14th January 2020: Participated as a chair of the academic session 'Women in Biology: Past and Present' in a two Day National seminar on 'Role of Women Scientists in Developing Science and Society in India' organized by The Asiatic Society, Kolkata at the Vidyasagar Hall of the Asiatic Society, Kolkata.
3. 8th-10th February 2017: Participated as a part of the organizing committee in the International Symposium on 'Insights to Plant Biology in the Modern Era' held at Bose Institute, Kolkata, India.

4. 17th December 2015: Participated in a One day Symposium on 'Insight to Plant Biology Through Systems Approach' held in Bose Institute, Kolkata, India.
5. 07th – 10th December 2015: Presented a poster entitled '*Ustilago maydis* metacaspase UmMca aids in the clearance of stress induced intracellular protein aggregates' on the 56th International Annual Conference of The Association of Microbiologists of India (AMI 2015) held at JNU Convention Centre, Jawaharlal Nehru University, New Delhi.
6. 26 - 27 April 2012: participated in International Symposium on Mechanisms of Cellular Compartmentalization held at Phillipps University Marburg, Germany.
7. 30th March-11th April 2012: Presented a poster entitled 'Do secreted chorismate mutases have a conserved role as enzymatic effectors in the fungal kingdom?' at the 11th European Conference on Fungal Genetics held at Phillipps University Marburg, Germany.
8. 11-14 September 2011: Presented a poster entitled 'Mapping domains for uptake of Ustilago maydis secreted effectors into maize plants' at the 10th VAAM Symposium on Molecular Biology of Fungi held at Phillipps University Marburg, Germany.
9. 27-29 November 2008: Presented a poster entitled 'Cellular and Molecular Aspects of Stress Response of the Pathogen Entamoeba histolytica' at the International Conference on Perspective of Cell Signaling and Molecular Medicine held at Bose Institute Kolkata, India.

Intramural & Extramural Research Funding

- Investigating the role of HSP20 in the pathogenic development of *Ustilago maydis*, SERB-CRG (Ongoing: 2022-2025)
- Deciphering the involvement of programmed cell death in the pathogenic development of *Ustilago maydis*, CSIR, Govt. of India (Ongoing: 2019-2022).
- Evaluation of secreted proteases of *Ustilago maydis* as potential effector proteins, SERB-ECRA (Ongoing: 2018-2021).
- Survival strategies of corn smut fungus *Ustilago maydis* during host colonization, DST-INSPIRE Faculty Award (Completed: 2013-2018).
- Investigating the effector function of two T2 type extracellular ribonucleases of *Ustilago maydis*, Bose Institute intramural fund (2019-2022)