

## Dr. Dipankar Chakraborti

**Designation:** Associate Professor

**Qualification:** Ph.D., Jadavpur University (Life Sciences- 2008).

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### RESEARCH EXPERIENCE:

1. Ph.D. (2008) Bose Institute/ Jadavpur University, Kolkata, India.
2. Post-Doctoral Research:
  - (a) Bose Institute, Kolkata, India.
  - (b) Umeå Plant Science Centre, Umeå, Sweden.
  - (c) French National Institute for Agricultural Research (INRA), Versailles, France

### EXPERIENCE OF WORK IN OTHER INSTITUTES AS VISITING RESEARCHER

1. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, AP, India.
2. Botanical Institute, University of Basel, Basel, Switzerland.

### RESEARCH INTEREST:

**Development of biotic stress tolerance in legumes and other crops:** Major breakthrough in productivity of different crops has still remained elusive in spite of appreciable technological advances. Strategies need to be developed for solving the problem of management of pod borers/ fruit borers and sucking pests to meet the future demand for crops. Development of insect resistance/tolerance in crop plants using various strategies is the focus area of our group. Development of transformation systems for important crop plants is another area of research. Presently we are involved in collaborative research with Bose Institute, Kolkata, Tocklai Tea Research Institute, Assam and Indian Statistical Institute, Giridih.

**Stress genomics of crop plants:** Fungal and bacterial pathogens cause the most severe diseases of crops throughout the world. Lack of information on potential resistant genes limits breeding and gene transfer technologies. A thorough understanding of plant-pathogen interaction at cellular and molecular level is essential for identification of potential genes, involved in counteracting disease progression. Presently we are involved in experiments to trigger the disease responsive pathways and monitoring expressions of novel transcripts involve in disease resistance. Our future goal is to find out role of these transcripts in plant disease resistance.

### PROJECTS UNDERTAKEN:

- 1) **Indo-Swiss Collaborative Biotechnology (ISCB) - DBT funded project 'Evaluation of ASAL expressing chickpea transgenic plants for the inheritance of aphid resistance'** (CoPI, PI: Prof. Sampa Das, Bose Institute, Kolkata). Duration: 2009 - 2012.

- 2) **Indian Council of Agricultural Research (ICAR)** funded project ‘**Development of pod borer resistant transgenic pigeonpea and chickpea**’ (1<sup>st</sup> Phase). Duration: 2011 - 2013.
- 3) **Science and Engineering Research Board, Department of Science and Technology (DST)** funded project ‘**Identification of molecular factors associated with *Fusarium udum* resistance in pigeonpea [*Cajanus cajan* (L.) Millspaugh] cultivars**’. Duration: 2012 - 2016.
- 4) **Indian Council of Agricultural Research (ICAR)** funded project ‘**Development of pod borer resistant transgenic pigeonpea and chickpea**’ (2<sup>nd</sup> Phase). 2014 - 2017
- 5) **Department of Biotechnology** funded project “**Understanding the mechanisms of resistance in sucking pest, *Helopeltis theivora* and development of microbe- based bioformulation against major tea pests**”. Duration 2021-2023.

#### **GROUP MEMBERS:**

1. **Mr. Sanatan Ghosh** (DST INSPIRE - Junior Research Fellow)
2. **Ms. Chitrlekha Roy** (Junior Research Fellow – DBT project)
3. **Mr. Sudipta Naskar** (U.G.C. – Junior Research Fellow)
4. **Ms. Piya Rahaman** (Research Fellow)
5. **Dr. Anjan Hazra** (SERB - National Post-Doctoral Fellow)
6. **Ms. Nilanjana Sarkar** (U.G.C. – Junior Research Fellow)
7. **Ms. Sweta Mahanta** (DBT – Junior Research Fellow)

#### **Past Members:**

1. **Dr. Gourab Ghosh:** Ph. D. awarded under Department of Botany, University of Calcutta, on June, 2017; **Title of the thesis:** Expression of insecticidal endotoxins Cry1Ac and Cry2Aa in pigeonpea to combat the infestation of *Helicoverpa armigera*
2. **Dr. Arnab Purohit:** Ph.D. awarded under Department of Biotechnology, University of Calcutta on 22<sup>nd</sup> February, 2021; **Title of the thesis:** An approach towards understanding the resistance response of pigeonpea (*Cajanus cajan* L. Millspaugh) against *Fusarium udum*
3. **Dr. Shreeparna Ganguly:** Ph.D. awarded under Department of Biotechnology, St. Xavier’s College, University of Calcutta on 11<sup>th</sup> September, 2021; **Title of the thesis:** Development of selectable marker free transgenic pigeonpea conferring resistance against *Helicoverpa armigera*

#### **PUBLICATIONS:**

##### **A. Publications in referred journals:**

- 1) Dutta I, Saha P, Majumder P, Sarkar A, **Chakraborti D**, Banerjee S and Das S (2005) The efficacy of a novel insecticidal protein, *Allium sativum* leaf lectin (ASAL), against

homopteran insects monitored in transgenic tobacco. **Plant Biotechnology Journal** 3: 601-611.

- 2) **Chakraborti D**, Sarkar A and Das S (2006a) Efficient and rapid *in vitro* plant regeneration system for Indian cultivars of chickpea (*Cicer arietinum* L.). **Plant Cell Tissue and Organ Culture** 86: 117-123.
- 3) **Chakraborti D**, Sarkar A, Gupta S and Das S (2006b) Small and large scale genomic DNA isolation protocol for chickpea (*Cicer arietinum* L.), suitable for molecular marker and transgenic analyses. **African Journal of Biotechnology** 5: 585-589.
- 4) Saha P\*, **Chakraborti D\***, Sarkar A, Dutta I, Basu D, Das S (2007) Characterization of vascular specific *RSs1* and *roIC* promoters for their utilization in engineering plants to develop resistance against hemipteran insect pests. **Planta** 226:429-442. \***Equal contribution**
- 5) Arora R, Sharma HC, Dhillon MK, **Chakraborti D**, Das S, Romeis J (2007) Impact of *Allium sativum* leaf lectin on the Helicoverpa armigera larval parasitoid *Camponotus chloridea*. **Journal of SAT Agricultural Research** 3 (1), 1-3
- 6) Roy A, **Chakraborti D** and Das S (2008) Effectiveness of garlic lectin on red spider mite of tea. **Journal of Plant Interactions** 3:157-162.
- 7) **Chakraborti D**, Sarkar A, Mondal HA, Schuermann D, Hohn B, Sarmah BK and Das S (2008) Cre/lox system to develop selectable marker free transgenic tobacco plants conferring resistance against sap sucking homopteran insect. **Plant Cell Reports** 27:1623-1633.
- 8) **Chakraborti D**, Sarkar A, Mondal HA and Das S. (2009) Tissue specific expression of *Allium sativum* leaf agglutinin (ASAL) in important pulse crop chickpea (*Cicer arietinum* L.) to resist the phloem feeding *Aphis craccivora*. **Transgenic Research** 18:529-544.
- 9) Gupta S\*, **Chakraborti D\***, Basu D and Das S. (2009) A molecular insight into the early events of chickpea and *Fusarium oxysporum* f. sp. *ciceri* (Race 1) interaction through cDNA-AFLP technique. **Phytopathology** 99:1245-1257. \***Equal contribution**
- 10) Sengupta S, **Chakraborti D**, Mondal HA and Das S. (2010) Selectable antibiotic resistance marker gene-free transgenic rice harbouring the garlic leaf lectin gene exhibits resistance to sap-sucking planthoppers. **Plant Cell Reports** 29:261–271.
- 11) Gupta S, **Chakraborti D**, Sengupta A, Basu D and Das S. (2010) Primary metabolism of chickpea is the initial target of wound inducing early sensed *Fusarium oxysporum* f. sp. *ciceri* Race I **PLoS ONE** 5(2): e9030. doi:10.1371/journal.pone.0009030.
- 12) Gupta S, **Chakraborti D**, Basu D and Das S. (2010) In search of Decoy/Guardee to *R* Genes: deciphering the role of sugars in defense against *Fusarium* wilt in chickpea. **Plant Signaling and Behavior** 8(9) 1081-1087.
- 13) Mondal HA, **Chakraborti D**, Majumder P, Roy P, Roy A, Gupta Bhattacharya S and Das S. (2011) Allergenicity assessment of *Allium sativum* leaf agglutinin (ASAL), a potential candidate protein for developing sap sucking insect resistant food crops **PLoS ONE** 6(11): e27716. doi:10.1371/journal.pone.00027.
- 14) Bala A, Roy A, Das A, **Chakraborti D** and Das S (2013) Development of selectable marker free, insect resistant, transgenic mustard (*Brassica juncea*) plants using Cre/lox mediated recombination **BMC Biotechnology** 13:88.

- 15) Le Hir R, Sorin C, **Chakraborti D**, Moritz T, Schaller H, Tellier F, Robert S, Morin H, Bako L and Bellini C (2013) ABCG9, ABCG11 and ABCG14 ABC transporters are required for vascular development in *Arabidopsis*. **Plant Journal** 76: 811–824.
- 16) Ghosh G, Purohit A, Chaudhuri RK, and **Chakraborti D** (2014) Advances in genetic transformation of important pulse crop pigeonpea. **Open Access Biotechnology** 3(1):5.
- 17) Ghosh G, Purohit A, Ganguly S, Chaudhuri RK and **Chakraborti D** (2014) In vitro shoot grafting on rootstock: An effective tool for *Agrobacterium*-mediated transformation of pigeonpea (*Cajanus cajan* (L.) Millsp.). **Plant Biotechnology** 31:301-308.
- 18) Chatterjee M, Gupta S, Bhar A, **Chakraborti D**, Basu D and Das S. (2014) Analysis of root proteome unravels differential molecular responses during compatible and incompatible interaction between chickpea (*Cicer arietinum* L.) and *Fusarium oxysporum* f. sp. *ciceri* Race1 (Foc1). **BMC Genomics** 15:949
- 19) LeHir R, Spinner L, Klemens PAW, **Chakraborti D**, Marco F, Vilaine F, Wolf N, Lemoine R, Porcheron B, Ge'ry C, Te'oule' E, Chabout S, Gre'gory M, Neuhaus HE, Dinant S and Bellini C (2015) Disruption of the Sugar Transporters AtSWEET11 and AtSWEET12 Affects Vascular Development and Freezing Tolerance in *Arabidopsis*. **Molecular Plant** 8:1687–1690.
- 20) Le Hir R, Castelain M, **Chakraborti D**, Moritz T, Dinant S and Bellini C (2017) *AtbHLH68* a *bHLH* transcription factor expressed in the vascular system controls ABA homeostasis and drought stress tolerance in *Arabidopsis*. **Physiologia Plantarum** 160: 312–327.
- 21) Purohit A, Ganguly S, Ghosh G, Chaudhuri R K, Datta S, and **Chakraborti D** (2017) Variability among isolates of *Fusarium udum* and the effect on progression of wilt in pigeonpea **European Journal of Plant Pathology** 149:73–87.
- 22) Ghosh G, Ganguly S, Purohit A, Chaudhuri R K, Das S and **Chakraborti D** (2017) Transgenic pigeonpea events expressing Cry1Ac and Cry2Aa exhibit resistance to *Helicoverpa armigera*. **Plant Cell Reports** 36:1037-105.
- 23) Ganguly S, Ghosh G, Purohit A, Sreevathsa R, Chaudhuri R K, Das S and **Chakraborti D** (2018) Effective Screening of Transgenic Pigeonpea in Presence of Negative Selection Agents. **Proc. Natl. Acad. Sci., India, Sect. B Biol. Sci.**88:1565–1571
- 24) Ganguly S, Ghosh G, Purohit A, Chaudhuri R K and **Chakraborti D** (2018) Development of transgenic pigeonpea using high throughput plumular meristem transformation method. **Plant Cell Tissue and Organ Culture** 135:73-83.
- 25) Ganguly S, Ghosh G, Ghosh S, Purohit A, Kundu Chaudhuri R K, Das S and **Chakraborti D** (2020) Plumular meristem transformation system for chickpea: an efficient method to overcome recalcitrant tissue culture responses. **Plant Cell Tissue and Organ Culture** 142:493–504.
- 26) Naskar S, Roy C, Ghosh S, Mukhopadhyay A, Hazarika LK, Chaudhuri RK, Roy S, **Chakraborti D** (2021) Elicitation of biomolecules as host defense arsenals during insect attacks on tea plants (*Camellia sinensis* (L.) Kuntze). **Applied Microbiology and Biotechnology** 105: 7187–7199.
- 27) Bayen S, Roy S, **Chakraborti D**, Mukhopadhyay A, Hazarika LK, Pramanik P, Borchetia S, Mukherjee S (2021) Mutualistic relation of termites with associated microbes for their harmonious survival. **Symbiosis**, 85:145–161.

- 28) Purohit A, Ghosh S, Ganguly S, Negi MS, Tripathi SB, Chaudhuri RK, **Chakraborti D** (2021) Comparative transcriptomic profiling of susceptible and resistant cultivars of pigeonpea demonstrates early molecular responses during *Fusarium udum* infection. **Scientific Reports** **11**, 22319. <https://doi.org/10.1038/s41598-021-01587-7>.
- 29) Ganguly S, Purohit A, Ghosh S, Chaudhuri RK, Das S, **Chakraborti D** (2022) Clean gene technology to develop selectable marker-free pod borer-resistant transgenic pigeon pea events involving the constitutive expression of Cry1Ac. **Applied Microbiology and Biotechnology**, 106:3051–3067.
- 30) Mondal S, Purohit A, **Chakraborti D**, Khan MR and Mukherjee A (2022) First Report of *Pratylenchus zae* on Upland Rice from Jharkhand, India. **Plant Disease**, 106:1765
- 31) Ghosh S, Purohit A, Hazra A, Mukherjee A, Bhar A, Gupta S, Chaudhuri RK, and **Chakraborti D** (2022) Differential transcript expression profiles of susceptible and resistant pigeonpea cultivars at an early time point during *Fusarium udum* infection. **Frontiers in Genetics**, 13:1009127. <https://doi.org/10.3389/fgene.2022.1009127>. Published on: 20<sup>th</sup> September 2022.
- 32) Pandey AK, Dinesh K; Nirmala NS, Kumar A, **Chakraborti D**, Bhattacharyya A (2023) Insight into tomato plant immunity to necrotrophic fungi. **Current Research in Biotechnology**. <https://doi.org/10.1016/j.crbiot.2023.100144>
- 33) Hazra A, Ghosh S, Naskar S, Rahaman P, Roy , Kundu A, Chaudhuri RK, **Chakraborti D** (2023) Global transcriptome analysis reveals fungal disease responsive core gene regulatory landscape in tea. **Scientific Reports**. **13**: 17186. <https://doi.org/10.1038/s41598-023-44163-x>

## B. Book Chapters:

- 1) Purohit A, Ganguly S, Chaudhuri RK, and **Chakraborti D** (2019) Understanding the Interaction of Molecular Factors During the Crosstalk Between Drought and Biotic Stresses in Plants, In: *Molecular Plant Abiotic Stress: Biology and Biotechnology*, First Edition. Editors: Roychoudhury A and Tripathi D K, **John Wiley & Sons Ltd**. Page 427-446.
- 2) Ganguly S, Purohit A, Chaudhuri RK, Das S and **Chakraborti D** (2020) Embryonic explant and plumular meristem transformation methods for development of transgenic pigeonpea, In: *Legume Genomics: Methods and Protocols*, Methods in Molecular Biology, vol. 2107, [https://doi.org/10.1007/978-1-0716-0235-5\\_17](https://doi.org/10.1007/978-1-0716-0235-5_17), Editors: Mukesh Jain and Rohini Garg, **Springer Nature**. Page 317-333.
- 3) Chaudhuri RK and **Chakraborti D** (2021) Bioactive Compounds from *In - vitro* Culture of *Swertia Chirayita* (Roxb. ex Flem.) Karsten: Identification and Quantification, In: *Plant-Based Functional Foods and Phytochemicals: Traditional Knowledge to Present Innovation*, Editors: Megh R. Goyal, Hafiz Ansar Rasul Suleria, Arijit Nath, **Apple Academic Press, Inc**. Page 311-333.
- 4) B Nandini, Uday G Reddy, BP Mallikarjuna, B Manu, PV Vaijyanthi, M Ashwini, P Surendra, AG Vijayakumar, CJ Kumar, L Manjunath, Sanatan Ghosh, Shreeparna Ganguly, Rituparna Kundu Chaudhuri, **Dipankar Chakraborti** (2022) Genomic Design for

Abiotic Stress Resistance in Pigeonpea, In: Genomic Designing for Abiotic Stress Resistant Pulse Crops, Editor: Chittaranjan Kole, **Springer Nature**, Page 169-248 [https://doi.org/10.1007/978-3-030-91039-6\\_6](https://doi.org/10.1007/978-3-030-91039-6_6)

- 5) Shreeparna Ganguly, Rituparna Kundu Chaudhuri and **Dipankar Chakraborti** (2022) Genetic Improvement of Pigeon-Pea (*Cajanus cajan* (L.) Millsp.) for Insect Resistance: Strategies and Achievements. In: Genetic Methods and Tools for Managing Crop Pests, Editor: A. K. Chakravarthy, **Springer Nature**, Page 579-596, [https://link.springer.com/chapter/10.1007/978-981-19-0264-2\\_24](https://link.springer.com/chapter/10.1007/978-981-19-0264-2_24)
- 6) Arnab Purohit, Sanatan Ghosh, Rituparna Kundu Chaudhuri and **Dipankar Chakraborti** (2022) Biological control of *Fusarium* wilt in legumes. In: Plant Stress Mitigators. 1st Edition - August 1, 2022, Editors: Mansour Ghorbanpour and Muhammad Adnan Shahid, **Elsevier**, <https://www.sciencedirect.com/science/article/abs/pii/B9780323898713000197?via%3Dihub>
- 7) Aoleca Mukherjee, Anjan Hazra, Dwaipayan Sinha, Prathyusha Cheguri, Shruthi H B, Sanatan Ghosh, Naresh Bomma, Rituparna Kundu Chaudhuri, Prakash I. Gangashetty, and **Dipankar Chakraborti** (2023). Grain Micronutrients in Pigeonpea: Genetic Improvement Using Modern Breeding Approaches. In: Kole, C. (eds) Compendium of Crop Genome Designing for Nutraceuticals. **Springer Nature**, Singapore. [https://doi.org/10.1007/978-981-19-3627-2\\_28-1](https://doi.org/10.1007/978-981-19-3627-2_28-1)

#### C. Published Proceedings:

- 1) Das S, Banerjee S, Dutta I, Majumder P, Sarkar A, **Chakraborti D**, Saha P and Mondal H A (2003) Developing Insect Resistance in Plants: A Part of The Crop Management Programme. In: Borah RC et al. (eds), Bioprospecting of Commercially Important Plants. Proc. Nat. Symp. ISAB-JC, 6-17.
- 2) **Chakraborti D**, Sarkar A, Majumder P, Mondal HA, Gupta S and Das S (2007) Mannose binding *Allium sativum* leaf lectin expression in chickpea for sap sucking insect pest resistance. In: Kharkwal MC (ed.) Proceeding of The Fourth International Food Legumes Research Conference (IFLRC-IV), New Delhi, India
- 3) Chaudhuri RK and **Chakraborti D** (2014) *Agrobacterium*-mediated transformation of medicinally important herb *Bacopa monnieri* (L.). In: Proceedings of UGC sponsored National Seminar 'Prospects of Biotechnology in Rural Bengal', 17-18 January, Uluberia College, Kolkata.

#### D. GenBank Submissions:

- 1) Datta I, Saha P, Majumder P, Sarkar A, **Chakraborti D**, Banerjee S and Das S. *Allium sativum* mannose-binding insecticidal lectin mRNA, partial cds. [NCBI Accession No. AY866499]

- 2) **Chakraborti D**, Mondal HA, Sarkar A, Saha P, Dutta I, Majumder P and Das S. *Arum maculatum* leaf mannose binding insecticidal lectin precursor, mRNA, partial cds. [NCBI Accession No.DQ083542]
- 3) Sarkar A, Saha P, **Chakraborti D**, Mondal HA and Das S. *Agrobacterium rhizogenes* strain A4 plasmid pRirolC gene, promoter region. [NCBI Accession No.DQ160187]
- 4) Sarkar A, Saha P, **Chakraborti D**, Dutta I, Banerjee S and Das S. *Annona squamosa* mannose-binding seed lectin mRNA, complete cds. [NCBI Accession No. DQ640308]
- 5) Saha P, Sarkar A, **Chakraborti D**, Modal H, Banerjee N, Majumder P, Dutta I, Banerjee S. and Das S. *Allium cepa* mannose-binding insecticidal leaf lectin mRNA, complete cds. [NCBI Accession No. DQ255944]
- 6) Mondal HA, Saha P, Sarkar A, **Chakraborti D**, Dutta I, Majumder P and Das S. *Amorphophallus paeonifolius* var. *campanulatus* mannose-binding leaf lectin mRNA, complete cds. [NCBI Accession No. DQ202395]
- 7) **Chakraborti D**, Mondal HA and Das S *Allium sativum* mannose-binding leaf lectin mRNA, complete cds. [NCBI Accession No. EU252577]
- 8) Gupta S, **Chakraborti D**, Basu D and Das S. (2009) A molecular insight into the early events of chickpea and *Fusarium oxysporum* f. sp *ciceris* (Foc) Race 1 interaction through cDNA-AFLP technique. Submission of **62 ESTs** to NCBI, Accession no. G0935217 - G0935222 and G0660518 - G0660573.
- 9) Purohit A, Ghosh G, Ganguly S and **Chakraborti D**. (2014) *Pisum sativum* cultivar GF68 ubiquitin conjugating enzyme (UBC4) gene ,promoter region. [NCBI Accession No. KJ482535]
- 10) Purohit A., Ganguly S., Kundu Chaudhuri R. and **Chakraborti D**. (2018) cDNA-AFLP mediated identification of transcript derived fragments (TDFs) associated with *Fusarium udum* resistance or susceptibility in pigeonpea (*Cajanus cajan* (L.) Millsp.), Submission of **58 ESTs** to NCBI [Accession no. MF621019-MF621020, MF624632, MF661776-MF661778, MF684635-MF684651, MF737356-MF737368, MF774337-MF774342 and MH188930-MH188945]
- 11) Roy C., Roy S., **Chakraborti D**. (2023) Identification of Tea termite associated fungal community, Submission of 36 rRNA-ITS sequences to NCBI [Accession no. OR381786-OR381821].
- 12) **Chakraborti D**. (2023) *Microtermes obesi* gallery and *Odontotermes obesus* mound mycobiome, submission of raw sequence reads (Metadata) to NCBI [BioProject Accession no. PRJNA1002248].

#### PATENTS:

- 1) A mannose binding lectin from leaves of *Allium sativum* effective against white fly, and process for its preparation. Indian Patent Application No: 889/KOL/2005, Date of Filing: 28 September 2005, Grant Date: 10 February 2009, Publication date: 13 February 2009, Patent No. 228783, **Applicant:** Bose Institute, Kolkata, India, **Inventors:** Sampa Das, Santanu Banerjee, Pralay Majumdar, Hossain Ali Mondal, Prasenjit Saha, **Dipankar Chakraborti**.

- 2) An improved process for preparing pure mannose-binding lectin from *Allium sativum* effective against white fly, cotton aphid and *Aphis craccivora*. Application ID: 481/KOL/2008, Date of Application: 2008-03-10, Publication No: 26/2008, Publication type: INA, Ipc Classification: A61K38/17, Examination date: 2008-06-10, **Applicant:** Bose Institute, Kolkata, India, **Inventors:** Sampa Das, **Dipankar Chakraborty** and Hossain Ali Mondal.
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