



Dr. Dipankar Chakraborti

Department: Biotechnology

Designation: Assistant 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 demands for crops. Our plan is to use different insecticidal protein including *Bacillus thuringiensis* Cry proteins, lectins etc. to develop insect resistant plants using transgenic strategies. Development of transformation systems for important crop plants is another area of research by our group.

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 isolation of potential genes, involved in counteracting disease progression. Presently we have initiated research in this direction and designed experiments to trigger the disease responsive pathways to monitor expressions of novel transcripts involved in disease resistance. Our future goal is to find out role of these transcripts in plant disease resistance.

PROJECTS UNDERTAKEN:

- 1) Co-Principal Investigator of the Indo-Swiss Collaborative Biotechnology (ISCB) - DBT funded project 'Evaluation of ASAL expressing chickpea transgenic plants for the inheritance of aphid resistance'** (Principal Investigator: Prof. Sampa Das, Bose Institute, Kolkata). Duration: September 2009 - August 2012.
- 2) Principal Investigator of the Indian Council of Agricultural Research (ICAR) funded**

project '**Development of pod borer resistant transgenic pigeonpea and chickpea**' (1st Phase). Duration: January 2011 - December 2013.

- 2) Principal Investigator of the **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: July 2012 - February 2016.
- 3) Principal Investigator of the **Indian Council of Agricultural Research (ICAR)** funded project '**Development of pod borer resistant transgenic pigeonpea and chickpea**' (2nd Phase). Start Date 1st January 2014.

GROUP MEMBERS:

1. **Mr. Arnab Purohit** (SRF); Registered as Ph.D. fellow at Department of Biotechnology, University of Calcutta
2. **Ms. Shreeparna Ganguly** (SRF); Registered as Ph.D. fellow at Department of Biotechnology, St. Xavier's College, University of Calcutta
3. **Mr. Sanatan Ghosh** (JRF); Pre-Registration stage of Ph.D. program at Department of Biotechnology, St. Xavier's College, University of Calcutta

Past Member: Dr. Gourab Ghosh (Ph. D. awarded on June, 2017); **Title of the thesis:** Expression of insecticidal endotoxins Cry1Ac and Cry2Aa in pigeonpea to combat the infestation of *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 *Campoletis chloridae*. **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, Kundu Chaudhuri R, 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, Kundu Chaudhuri R, 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, Kundu Chaudhuri R and **Chakraborti D** (2017) Effective Screening of Transgenic Pigeonpea in Presence of Negative Selection Agents. **Proc. Natl. Acad. Sci., India, Sect. B Biol. Sci.** DOI: 10.1007/s40011-017-0895-3.
- 24) Ganguly S, Ghosh G, Purohit A, Kundu Chaudhuri R and **Chakraborti D** (2018) Development of transgenic pigeonpea using high throughput plumular meristem transformation method. **Plant Cell Tissue and Organ Culture**, DOI: 10.1007/s11240-018-1444-3 (in press).

B. 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.

GENE BANK 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 TDFs to NCBI [Accession no. MF621019-MF621020, MF624632, MF661776-MF661778, MF684635-MF684651, MF737356-MF737368, MF774337-MF774342 and MH188930-MH188945]

PATENTS:

1. Mannose binding lectin from *Allium sativum* leaves, effective against white fly and cotton aphid and process for its preparation **Application:** 889/KOL/2005, **Publication date:** 2006-08-04, **Patent No. 228783**, **Applicant:** Bose Institute, Kolkata, India, **Inventor:** 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:** 481/KOL/2008 A, **Filing date:** 2008-03-10, **Publication date:** 2008-06-27 **Applicant:** Bose Institute, Kolkata, India, **Inventor:** Sampa Das, **Dipankar Chakraborti**, Hossain Ali Mondal
