APARNA SINGH

POSTDOCTORAL FELLOW
UNIVERSITY OF NEW BRUNSWICK
CANADA

PROFILE

Molecular Biologist with 5+ years of international research experience and in-depth background in molecular biology, cellular biology, genetic engineering, gene discovery, multiomics, plant natural products biosynthesis.

CONTACT

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EXPERIENCE

MITACS ACCELERATE INDUSTRIAL POSTDOCTORAL FELLOW
Department of Chemistry, University of New Brunswick, Canada
JUNE 2021-PRESENT
Biochemical characterization of Perrotettinene biosynthesis pathway in *Radula complanata.*

Key roles
Managed and executed research project. Conference presentations, writing manuscripts and project reports. Developed and optimized multiple molecular biology protocols and bioassays. Trained and mentored undergraduate students. Responsible for hands-on training of laboratory protocols and instruments, including PCR, Agarose gel electrophoresis, SDS-PAGE and western blotting, qPCR and HPLC.

MITACS ACCELERATE INDUSTRIAL POSTDOCTORAL FELLOW
Department of Biological Sciences, University of Lethbridge, Canada
JULY 2019-MARCH 2021
Functional characterization of Cannabidiolic acid synthase (CBDAS) gene variants obtained from in-house Cannabis cultivars to determine THC/CBD ratio.

Advanced Teaching Assistant - Molecular Biology

Key roles
Functional analysis of CBDAS variants extracted from genomic data of more than 25 in-house cannabis cultivars. Analyzing SNPs in CBDAS variants and their effect on CBD content. Laboratory management: assisted in setting up a molecular biology lab, and developing lab protocols. Worked as an Advanced Teaching Assistant and taught Molecular Biology course and lab course to undergraduate students.

POSTDOCTORAL ASSOCIATE
Department of Biological Sciences at the University of Calgary, Canada
JULY 2018-JUNE 2019

Discovering the role of heterodimeric *O*-methyltransferases (OMTs) in noscapine biosynthesis in *Papaver somniferum.* Biochemical analysis (enzymatic characterization) of heterodimers OMT2:OMT3 and OMT2:6OMT

TECHNICAL SKILLS

Molecular Biology- RNA and DNA extraction, quantitative Real Time PCR, Gateway cloning, MULTIcoli cloning, Restriction digestion and ligation cloning, protein expression and purification from bacterial and plant system, western blotting, SDS-PAGE, plant tissue culture, geldoc system, spectrophotometer, nanodrop, genetic transformation using *Agrobacterium tumefaciens*, transient expression in *N. benthamiana*.

Bioinformatics- Transcriptome data study, BLAST search, Clustal W, Serial cloner, Expasy, candidate genes identification, identification of top expressed genes, KEGG, MEGA, Snapgene, Addgene, Serial cloner.

Neurobiology- Cell culture of differentiated and non-differentiated neuronal cells, nuclear and cytosolic protein extraction, protein assay, single stranded DNA extraction, LDH assay.

Microbiology- Total coliform determination, *E. coli* determination, microbial characterization of water and soil samples, isolation of plant growth promoting bacteria (P.G.P.R) from rhizosphere. Isolation and

Key roles

Conducted integrated transcriptomics and metabolomics analysis. Prepared presentations and lab reports. Assisted lab coworkers in research experiments, data collection and analysis. Participated in lab group discussions. Published an article in a scholarly journal. Provided a biweekly research update.

RESEARCHER

Neuronal and Cellular Biology laboratory, University du Quebec at Trois-Rivieres, Canada

JANUARY 2014- AUGUST 2014

Determining anti-inflammatory and anti-apoptotic effects of natural polyphenols on neuronal cells in context to Parkinson's disease.

Key roles

Neuronal cell growth and maintenance. Developed and maintained databases, pulling relevant data. Collected and analyzed data to contribute to manuscripts and publications. Trained undergraduate students, summer interns and volunteers.

ECOTECHNOLOGIST

Ecomen Laboratories, Lucknow, India

JULY 2012-DECEMBER 2012

Analysis of water, soil and air samples collected from Industrial sites

Key roles

Worked successfully with diverse group of coworkers to accomplish goals and address issues related to our products and services. Worked closely with team members to deliver project requirements and meet deadlines. Prioritized and organized tasks to efficiently accomplish service goals. Demonstrated leadership by making improvements to work processes and helping to train others. Provided excellent service and attention to customers when face-to-face or through phone conversations.

identification of bacteria and fungi from air, water and soil. Chemical and microbiological analysis of wastewater, drinking water and soil samples collected from industrial sites.

Analytical Chemistry- Alkaloid extraction, TLC with different coloration tests (Dragondorff, FeCl3, potassium permanganate), HPLC (Waters, Shimadzu with PDA detector, Agilent) and LC-MS/MS (Waters HPLC coupled to Micromass Quattro LC), enzyme assays.

TEACHING EXPERIENCE

Advanced Teaching Assistant
Molecular Biology
Department of Biological Sciences, University of Lethbridge, Canada

INTERNSHIPS

"Food Preservation and Management"
Institute of Entrepreneurship and Development, India
(December 2011 - February 2012)

"Microbial Techniques – Learning to Handle Microbes"
Institute of Entrepreneurship and Development, India
(June 2009 - July 2009)

EDUCATION

PH.D. (2014-2018)

Cellular and Molecular Biology
University du Quebec at Trois-Rivieres, Quebec, Canada

THESIS TITLE

"STUDY OF PRECURSOR GENES INVOLVED IN BIOSYNTHESIS PATHWAY OF AMARYLLIDACEAE ALKALOIDS USING INTEGRATED TRANSCRIPTOMICS AND METABOLOMICS APPROACH"

RESEARCH EXPERIENCE

Functional characterization of a candidate gene involved in Amaryllidaceae Alkaloids (AAs) biosynthesis and discovering other precursor genes of the pathway in *Narcissus pseudonarcisssus* 'King Alfred' using integrated transcriptomics and metabolomics. Developed a deep understanding of AAs metabolism by comparative transcriptome and metabolome study. For this, metabolic profiling (TLC, HPLC, and LC-MS/MS) of different tissue extracts was performed and transcriptome database was established of *Narcissus pseudonarcisssus* 'King Alfred' through HI-seq Illumina sequencing to identify potential genes responsible for AAs formation.

MASTERS (2008-2010)

M.Sc. in Biotechnology
Babasaheb Bhimrao Ambedkar University, India

DISSERTATION

"MOLECULAR ANALYSIS OF TRANSGENIC *NICOTIANA TABACUM* & GENETIC TRANSFORMATION OF *WITHANIA SOMNIFERA* WITH *SGT L4* GENE FOR OVEREXPRESSION USING *AGROBACTERIUM TUMEFACIENS*"

BACHELORS (2005-2008)

B.Sc. in Biotechnology
Chhatrapati Shahuji Maharaj University, Kanpur, India

PUBLICATIONS

Google scholar link (*https://scholar.google.com/citations?hl=en&user=TIL_zyAAAAAJ*)

- Laurence Tousignant[1], Aracely Maribel Diaz Garza[1], Bharat Bhusan Majhi[1], **Aparna Singh[1],** Isabel Desgagne-Penix[1,2] **(2022)** "Transcriptome analysis of *Leucojum aestivum* and identification of genes involved in norbelladine formation" **(Published-Planta)**
- **Singh A.**, Bilichak A., and Kovalchuk I. **(2020)** "The genetics of Cannabis – genomic variations of key synthases and their effect on cannabinoids content" **(Published- Genome)**
- **Aparna Singh.**, Ivette Menendez-Perdomo, Peter J Facchini, **(2019)** 'Benzylisoquinoline alkaloid biosynthesis in opium poppy – an update' **(Published-Phytochemistry Reviews)**
- **Singh A.**, Marie-Ange massicotte, Ariane Garand, Laurence Tousignant, Vincent Ouellette, Gervais Bérubé and Desgagné-Penix I. **(2018)** Cloning and characterization of norbelladine synthase catalyzing the first committed reaction in Amaryllidaceae alkaloid biosynthesis **(Published – BMC Plant Biology)**
- **Singh A.**, and Desgagné-Penix I. **(2017)** Transcriptome and metabolome profiling of *Narcissus pseudonarcissus* 'King Alfred' reveal components of Amaryllidaceae alkaloid metabolism. **(Published- Scientific Reports)**
- **Singh A.**, and Desgagné-Penix I. **(2015)** Chapter 3 Biosynthesis of Amaryllidaceae alkaloids: A biochemical outlook. **(Published - *Alkaloids: Biosynthesis, Biological Roles and Health benefits*, pp. 53-76. Nova Science Publishers, Editor - Eduardo Sobarzo-Sanchez)**
- **Singh A.**, and Desgagné-Penix I**. (2014)** Biosynthesis of the Amaryllidaceae alkaloids. **(Published-Plant Science Today)**

AWARDS, FELLOWSHIPS AND MEMBERSHIP

- June 2021-Present – Received ***MITACS Accelerate Industrial Postdoctoral Fellowship*** at University of New Brunswick
- July 2019-January 2021-Received ***MITACS Accelerate Industrial Postdoctoral Fellowship*** at University of Lethbridge
- July 2018-June 2019- Received ***NSERC Postdoctoral Fellowship*** at University of Calgary
- June 2016 – Awarded ***Canadian Association of Plant Biology (CAPB) Travel Award*** at CAPB Meeting
- June 2016- Received ***Centre SEVE Travel Scholarship*** from Centre SEVE
- September 2014-May 2018 Received ***NSERC PhD Fellowship*** at University du Quebec Trois-Rivieres
- Membership of the ***Canadian Society of Plant Biologists***

CONFERENCE PRESENTATIONS

- University du Quebec at Trois-Rivieres, 2018
  "Update on study of precursor genes involved in Amaryllidaceae alkaloid metabolism"
- Canadian Society of Plant Biologist Meeting at McGill University, 2017
  "Norbelladine Synthase – A novel enzyme involved in Amaryllidaceae alkaloid metabolism in

Narcissus pseudonarcissus cv. 'King Alfred"

- Centre SEVE Annual Meeting in Bromont, 2016
  "Understanding galanthamine metabolism in *Narcissus pseudonarcissus 'King Alfred'* by comparative transcriptome and targeted metabolism"
- Canadian Association of Plant Biology Meeting, Queen's University, Kingston, 2016
  "Transcriptome and targeted metabolome profile of *Narcissus pseudonarcissus 'King Alfred'* reveals component of galanthamine metabolism"
- 23rd University of Quebec Science Poster Contest, Trois-Rivières, 2016
  "Study of biosynthetic genes of precursors of Amaryllidaceae alkaloids"
- Journee Scientific sur la defense et la metabolism de vegetaux, 2016
  "Discovering unknown genes of Amaryllidaceae alkaloids biosynthesis pathway"
- Groupe de Recherche en Biologie Végétale (GRBV), 2015
  "Novel genes involved in Amaryllidaceae alkaloids biosynthesis"
- 84th Acfas Congress, University of Quebec in Montreal, 2016
  "Study of biosynthetic genes of precursors of Amaryllidaceae alkaloids"
- 83rd Congress of Acfas, University of Quebec in Rimouski, 2014
  "Characterization of the expression of the genes involved in the biosynthesis of precursors of Amaryllidaceae alkaloids."

ATTENDED CONFERENCES AND WORKSHOP (Selected)

- Canadian Society of Plant Biology Conference 2021
- Cyber security online course
  (University of Lethbridge)
- New approaches in LC-MS lipidomics
  (Dr. Dajana Vuckovic, Concordia university)
- Structural Biology of PsOMT2/6OMT
  (Ken Ng, University of Calgary)
- Visualization of cell signalling and metabolism with genetically engineered fluorescent indicators
  (Dr. Robert Campbell, Faculty of Science, University of Alberta)
- The Purification of Arabidopsis thaliana Shewanella - like Protein Phosphatase 1 and Elucidation of its Protein Interactome
  (University of Calgary)
- The role of effector proteins in the evolution of fungi and their interaction with plants
  (Richard Belanger, Chair Professor, Laval University)
- Next generation technologies for tomorrow's crops: getting to the roots of global food security
  (Leon Kochian, Centre SEVE)
- The middle lamella –the glue that holds cells together
  (Anja Geitmann, Mcgill University)