CURRICULUM VITAE

APARNA SINGH
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Education

Ph. D. (2014-2018)

Cellular and Molecular Biology (University du Quebec Trois-Rivieres, Quebec, Canada)
Research Area: Study of precursor genes involved in biosynthesis pathway of Amaryllidaceae Alkaloids using integrated transcriptomics and metabolomics approach
Supervisor: Dr. Isabel Desgagne-Penix

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*
Supervisor: Dr. Pratibha Misra (National Botanical Research Institute, India)

Bachelors (2005-2008)

B.Sc. in Biotechnology (Chhatrapati Shahu Ji Maharaj University, India)

Research Experience

During the Ph.D. I worked on 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. The aim was to develop a deep understanding of AAs metabolism by comparative transcriptome and metabolome study. For this, I performed metabolic profiling (TLC, HPLC, and LC-MS/MS) of different tissue extracts and established a transcriptome database of *Narcissus pseudonarcisssus* 'King Alfred' through HI-seq Illumina sequencing to identify potential genes responsible for AAs formation. I also performed Gateway cloning, protein expression, protein purification and enzyme assay.

Post-Doctoral Research Experience (July 2018- June 2019)

Currently working as a **Post-Doctoral Associate in the Department of Biological Sciences at the University of Calgary,** to discover the role of heterodimeric *O*-methyltransferases (OMTs) in noscapine biosynthesis in *Papaver Somniferum*. It involves biochemical analysis (enzymatic characterization) of heterodimers OMT2:OMT3 and OMT2:6OMT and their crystallographic analysis to decipher catalytic residues, followed by mutagenesis of identified catalytic residues for their functional analysis.

Peer-reviewed Articles

- **Singh A.,** Ivette M Menendez-Perdomo, M.Sc.; Peter J Facchini, PhD **(2019)** 'Benzylisoquinoline alkaloid biosynthesis in opium poppy – an update' **(Submitted-Phytochemistry Reviews April 2019)**
- **Singh, A.** Marie-ang 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. December 2018)**
- **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 7, Article number: 17356)**
- **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, Eduardo Sobarzo-Sanchez editor. February 2015).**
- **Singh, A.** and Desgagné-Penix, I**. (2014)** Biosynthesis of the Amaryllidaceae alkaloids. **(Published-Plant Sc. Today 1(3): 114-120).**

Oral and Poster Presentations

- 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, 2015
  "Characterization of the expression of the genes involved in the biosynthesis of precursors of Amaryllidaceae alkaloids"

Awards

- June 2016 - Canadian Association of Plant Biology (CAPB) Travel Award
- June 2016- Centre SEVE Travel Scholarship

Research Skills

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

- **Analytical Chemistry**- Alkaloid extraction, TLC with different coloration tests (Dragondorff, $FeCl_3$, potassium permanganate), HPLC (Waters, Shimadzu with PDA detector, Agilent) and LC-MS/MS (Waters HPLC coupled to Micromass Quattro LC), enzyme assays

- **Molecular Biology**- RNA extraction, quantitative Real Time PCR, Gateway cloning, protein expression and purification, western blotting, SDS-PAGE, plant tissue culture, genetic transformation using *Agrobacterium tumefaciens*.

- **Bioinformatics**- Transcriptome data study, BLAST search, Clustal W, Serial cloner, Expasy, candidate genes identification, identification of top expressed genes, KEGG, MEGA 6.06

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

Research Experience and Employment

- **2015** - Student researcher, Bio Forextra (Commercial firm), Levis, Quebec
- **2015** - Examiner, Department of Chemistry, Biochemistry and Physics, University of Quebec at Trois-Rivieres
- **2014** - Student researcher, Laboratory of Cellular Neurobiology, University of Quebec at Trois-Rivieres
- **2012** - Microbiologist at Ecomen Laboratories, India
- **2010** - Master's dissertation, Plant Transformation Laboratory National Botanical Research Institute, Lucknow, India

Mentoring Activities

Number of Mentees – 7 (2 Masters and 5 Undergraduate students)
Period: 2015 - 2017
Responsibilities: Deliver experimental training, collaboratively set research goals, delegate work, mentor learning growth, set action plans defining key steps for reaching research goals, assess student performance and provide feedback

Journal Review Activities

2017- "Inhibitory effects of Berberine hydrochloride on *Trichophyton mentagrophytes* and underlying mechanism"
Role: Manuscript co-reviewer
Journal: BioMed Central

Memberships

2016 - Member, Canadian Association for Plant Biotechnology, Canada
2015 - Member, Centre SEVE

Internships

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

(June 2009 - July 2009) "Microbial Techniques – Learning to Handle Microbes" Chhatrapati Shahu Ji Maharaj University, Kanpur, India

Conferences and Workshops

• 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)
• On the path towards pan-genome model for potato
(Martina Stromvik, Mcgill University)
• Pulses in wheat-based rotations modify soil N, root-associated microbes, and soil function
(Chantal Hamel, Agriculture and agroalimentaire Canada)
• In situ quantification of canola root biomass in relation to canola growth under climate stress in Quebec
(Centre SEVE, Quebec)
• Study of bioconversion of Butanol and Butalinic acid
(GRBV, Quebec)
• Plant science entrepreneurship workshop
(Centre SEVE, Quebec)
• Ecovalorization of plant species
(UQTR, Trois-Rivieres)
• Unravelling kinase specificity using dynamic phosphoproteomics
(Rendez-vous Genome Quebec, Laval University)
• Universal and multifunctional nature of Chaperones
(Professor Jean Luc Dralix, Illkirch France, UQTR, Trois-Rivieres)
• The multiple paths of science communication: a challenge, but also opportunities for researchers?
(Professor Yves Bergeron, UQTR, Trois-Rivieres)
• The emerging era of creating designer microbes- recent advancements in cloning and manipulating natural and synthetic chromosomes in yeast
(Bogumil Karas-Founder, Designer Microbes. Inc, UQTR, Trois-Rivieres)
• Gene regulatory networks in rice: water deficit, high temperature and agricultural environments
(Olivia Wilkins, Professor Mcgill University, specialist in abiotic stress in plants, UQTR, Trois-Rivieres)
• The future of "OMICS" applications
(Rendez-Vous Génome Québec, Sherbrooke)

• Bioinformatic workshop on using GENAP and GALAXY for genomics analysis
(Genome Quebec, Sherbrooke)
• Symposium Génome Québec - Genomic solutions for natural resources and the environment event
(Genome Quebec, Montreal)