

ROHAN A. PATIL

PhD Candidate, Department of Chemical Engineering

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SUMMARY

PhD candidate in Biochemical Engineering with over 4 years of research experience in Bioprocess development and optimization, Cell/Molecular biology and Cellular engineering

EDUCATION

University of Massachusetts, Amherst, MA

Aug 2007-Aug 2012 (expected)

Ph.D. in Chemical Engineering with certificate in Cellular Engineering, Advisor: Susan Roberts (GPA – 3.81/4.0)

Thesis: A multi-scale approach to understand secondary metabolite variability and cell population heterogeneity in dedifferentiated plant cell cultures

University of Mumbai - Institute of Chemical Technology (UDCT), India

July 2003 - June 2007

Bachelor of Chemical Engineering with Distinction Honors (GPA – 72% $\approx$ 3.8/4.0)

Senior year project: Designed and evaluated a manufacturing plant for the production of Monoethylene Glycol using supercritical hydrolysis

ACADEMIC EXPERIENCE

University of Massachusetts, Amherst, USA

Aug 2007 - present

- **Gene expression analysis and statistical analysis**: Performed gene expression analysis to understand the regulation of the biosynthetic pathway leading to enhanced levels of pharmaceutically important drug - paclitaxel from *Taxus* cell cultures
- **Bioprocess Development and Optimization**: Optimized media formulation and culture conditions (agitation, inoculum volume, time of transfer) for maximum growth and productivity of *Taxus* cell cultures
- **Process Characterization**: Successfully demonstrated that aggregate size distribution is the key process parameter associated with long term variability of paclitaxel accumulation in *Taxus* cell cultures
- **Bioseparation and Downstream Processing**: Successfully evaluated a series of solvents and extractants coupled with alterations in pH to improve the selective recovery of paclitaxel from aqueous cell culture stream
- **Flow cytometric analysis of cell cultures**: Upgraded flow cytometric assays to study cell cycle, growth and metabolite accumulation at single cell level to demonstrate population heterogeneity in plant suspension cultures
- **Bioinformatics and Metabolite analysis**: Collaborated with the Biology department and performed differential transcriptome analysis of *Taxus* cell cultures using next generation sequencing methods (Illumina, 454) to gain an understanding of the global pathways that regulate higher levels of paclitaxel accumulation
- **Method Development**: Developed methods and managed/troubleshoot analytical equipments such as HPLC/PDA, UPLC/PDA and Coulter Counter
- **Graduate Teaching Assistant**: Responsible for holding office hours to answer specific questions and supplement lectures for Introduction to Biochemical Engineering, Fundamentals of Cellular Engineering, and Heat and Mass transfer

INDUSTRIAL EXPERIENCE

Process Engineering Intern, Aarti Industries Ltd., Gujarat, India

May 2006 - June 2006

Suggested techniques to reduce material losses at different stages of Sulfuric acid plant

Prepared preliminary Process and Instrumentation diagram (PNID) for the Sulfuric acid plant

Summer Intern, Excel Industries Ltd., Maharashtra, India

May 2005 - June 2005

Monitored basic unit operations, research and scale up methodology used for industrial and specialty chemicals

SKILLS AND EXPERTISE

- Plant and microbial cell culture, aseptic techniques, fermentation, liquid-liquid extraction, immunofluorescence, enzyme activity and total protein assays, working knowledge of protein purification techniques, design of experiments (DOE)
- **Instrumentation**: Flow cytometer (BD LSR II, FACSVantage), bench-scale bioreactor (BioFlo 3000), HPLC/UPLC, Coulter Counter, UV/vis spectrophotometry, fluorescence microscopy, bioanalyzer for sugar concentration (YSI 2700)
- **Molecular Biology**: Genomic PCR, bacterial and plant cell transformation, quantitative RT-PCR, gene cloning, Gel electrophoresis, DNA sequencing analysis, microarray analysis, bioinformatics to analyze high-throughput genomic data
- **Software**: Origin, Perl, ImageJ, FlowJO, FACSDiva, Mathcad, Matlab, Adobe Illustrator and Photoshop

PUBLICATIONS AND BOOK CHAPTERS

- **Patil RA**, Kolewe ME, Normanly J, Walker E, Roberts SC. 2012. Contribution of taxane biosynthetic pathway gene expression to observed variability in paclitaxel accumulation in *Taxus* suspension cultures. *Biotechnology Journal* 7(3):418-427
- **Patil RA** and Roberts SC. 2012. Implications of cellular heterogeneity on plant cell culture performance. In Chandra S, Lata H, Varma A, eds. *Biotechnology for Medicinal Plants- Propagation and Improvement*. Springer-Verlag, Netherlands. Book ISBN: 978-3-642-29973-5
- **Patil RA**, Kolewe ME, Roberts SC. 2012. Cellular aggregation is a key process parameter associated with long term variability of paclitaxel accumulation in *Taxus* suspension cultures. *Under review, Plant Cell, Tissue and Organ Culture*
- **Patil RA** and Roberts SC. Effect of methyl jasmonate on growth and cell cycle progression of cultured *Taxus* cells. *Preprint*
- **Patil RA**, Keshari S, Normanly J, Walker E, Roberts SC. Differential transcriptome analysis of *Taxus* cell cultures exhibiting metabolic and morphological heterogeneity using next generation sequencing methods. *In preparation*
- McPartland T, **Patil RA**, Malone M, Roberts SC. 2012. Liquid-liquid extraction for recovery of paclitaxel from plant cell culture: Solvent evaluation and use of extractants for partitioning and selectivity. *Biotechnology Progress (Accepted)*, doi: 10.1002/btpr.1562
- Kolewe ME, **Patil RA**, Henson MA, Roberts SC. Isolation and characterization of heterogeneous cell populations from aggregated plant cells. *Under review, Journal of Biotechnology*

SELECTED CONFERENCE PRESENTATIONS AND POSTERS

- **Patil RA**, Kolewe ME, Henson MA, Roberts SC. 2011. Development of plant cell culture processes to produce natural product pharmaceuticals: Characterization, analysis, and modeling of plant cell aggregation, *Biochemical and Molecular Engineering XVII*, Seattle, WA (Poster)
- **Patil RA** and Roberts SC. 2010. Engineering Taxol biosynthesis in *Taxus* suspension cell culture, *American Council for Medicinally Active Plants (ACMAP)*, Rutgers University, New Brunswick, NJ (Oral Presentation)
- **Patil RA** and Roberts SC. 2009. Gene expression analysis of *Taxus* cell culture subpopulations for targeted metabolic engineering of secondary metabolite accumulation, *AIChE Annual Meeting*, Nashville, TN (Oral Presentation)
- **Patil RA** and Roberts SC. 2009. Gene expression analysis of *Taxus* cell culture subpopulations for targeted metabolic engineering of secondary metabolite accumulation, *Gordon Research Conference, Plant Metabolic Engineering*, Waterville, NH (Poster)
- **Patil RA**, Roberts LA, Roberts SC. 2008. A novel interdisciplinary biotechnology process engineering laboratory course at the University of Massachusetts Amherst, *AIChE Annual Meeting*, Philadelphia, PA (Oral Presentation)
- Gaurav V, **Patil RA**, Roberts SC. 2008. A FACS-based approach to characterizing culture heterogeneity based on accumulation of the anti-cancer agent paclitaxel in plant cell suspension cultures, *AIChE Annual Meeting*, Philadelphia, PA (Poster)

HONORS & LEADERSHIP EXPERIENCE

- Graduate advisor to initiate research projects for four undergraduate researchers, including one NSF funded researcher
- Mentored and trained new graduate students in cell culture techniques and on several instruments 2009-present
- Secretary, Chemical Engineering Graduate Student Association, UMass Amherst 2009-2010
- Awarded Student Travel Grants for:
 - Oral and Poster presentation at *AIChE Annual Meeting*, PA, 2008
 - Oral presentation at *AIChE Annual Meeting*, TN, 2009
 - Poster presentation at *Gordon Conference, Plant Metabolic Engineering*, NH, 2009
- Finance Secretary, Prodigy 2007, a national level technical event organized by Indian Institute of Chemical Engineers (IICChE) and Institute of Chemical Technology (ICT)
 - Responsible for Event management, Marketing and Accounting
- Associate, The UMass Amherst Institute for Cellular Engineering (ICE) IGERT 2008-present
- Associate, The Chemistry Biology Interface (CBI) program at UMass Amherst 2008-present
- Member, American Institute of Chemical Engineers (AIChE) 2009-present