# Manjinder Singh

***Research Professional IV***

*College of Engineering*
*University of Georgia*
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## Education

**Doctor of Philosophy in Microbiology**
Guru Nanak Dev University, Amritsar, India,
April, 2005

**Master of Science in Molecular Biology & Biochemistry**
Guru Nanak Dev University, Amritsar, India
December, 1998

**Bachelor of Science in Biosciences**
Guru Nanak Dev University, Amritsar, India
June, 1996

## Research Interests

*Biofuels from Algae**:*** Isolation and cultivation of algae for biodiesel, biogas, bioethanol production using lipid extraction, fermentation and anaerobic digestion technologies.

*Waste management/recycling**:*** Nutrient removal from industrial and domestic wastewater and converting into biomass as bioenergy, and feedstock source.

***Greenhouse gasses abatement***: Mitigation of $CO_2$ and other flue gases in the industrial emissions using microalgae cultivation and efficient gas to liquid mass transfer devices.

*Bioremediation**:*** Biotreatment of industrial wastewater for removal of recalcitrant compounds such as textile dyes, pesticides and heavy metals.

## Academic Appointments

**Research Professional IV,** *Department of Biological and Agricultural Engineering, University of Georgia*
March 2012 to Present:

**Postdoctoral Research Associate**, *Department of Biological and Agricultural Engineering, University of Georgia*
February 2010 to February 2012

- In charge of Microalgae Bioenergy Laboratory; performed innovative research experiment designing and execution.
- Involved in running research program on production of microalgae biofuels using waste streams and on energy production through anaerobic digestion of algal biomass
- Developed collaborative research projects with Industries and academic institutions on microalgae mediated integrated waste management coupled with biofuel production
- Supervised research staff and graduate students.
- Assisted in preparation of grant proposals, project reports.
- Prepared and published peer review research articles, book chapters and conference proceedings/presentations.
- Assisted in research process designing and administrative management of ongoing research projects.
- Performed key-contact role in industry collaborated pilot scale algal wastewater treatment system.

**Postdoctoral Research Associate**, Biochemical Engineering lab, Department of Chemical Engineering, *Monash University, Australia*
*2008-2009*

- Conducted research on growth of the marine and fresh water algae,
- Isolated, purify and characterize several algal strains for their biomass and lipid production potential.
- Performed committee responsibility (research supervision) of 2 graduate students.
- Set-up biochemical analysis laboratory for determination of biochemical composition of algae, media recycling and flue gas mass transfer in photobioreactors.
- Investigated effects of different biomass storage conditions on the biochemical composition of algae.
- Prepared and presented progress reports and presentations to the industry partner and the university research team.
- Performed key-contact role in industry collaborated on-site algae cultivation in photobioreactors for biodiesel production.
- Worked on-site with industrial partners on pilot scale algal cultivation system for recycling flue gas from power plant emissions.

**Postdoctoral Research Fellow**, *Institute for water and wastewater Technology, Durban University of Technology, Durban, South Africa*

2006-2008:

- Established and developed microalgae biofuels research program first time in the University.
- Initiated and upscaled algae cultivation research program from bench scale to pilot scale on-site industrial wastewater treatment system using microalgae.
- Developed an algae culture bank in DUT.
- Supervised 6 undergraduate and 2 master students for their research projects.
- Actively involved in developing professional relationships with industry and local municipalities for the implementation of algae biofuel technology at commercial level.
- Facilitated drafting of project reports, research manuscripts and conferences research articles.
- Publicized research outcomes via national newspapers and FM radio programs.

**Research Fellow** (graduate research assistant), Department of Microbiology, Guru Nanak Dev University, Amritsar, India.
1999-2006:

- Conducted research for the enrichment and isolation of bacteria having the ability to decolorize/ degrade azo dyes and development of efficient bacterial consortium capable of decolorizing azo dyes at faster rate.
- Optimized medium components and physico-chemical conditions for enhancing the decolorization efficiency of the developed consortium.
- Designed and developed sequential anoxic/aerobic bioreactor using enriched consortium for the continuous treatment of synthetic and actual textile industry wastewater.
- Aided in establishing bioremediation lab in the department.
- Managed master students in co-operation and in absence of Ph.D. advisor (one year sabbatical).
- Performed administrative management for ordering expendables and lab management protocols.

## Teaching Experience

*University of Georgia (2010-present)*

- Graduate Biomass Seminar ENGR/FORS 8020 (Spring 2012). Potential of Algae-based liquid fuels and other products. Center for Forest Business.
- Guest Lecture on course MIBO 4680/6680 (Spring 2011) Industrial Microbiology and Biotechnology followed by Field trip to my research lab.
- Delivered lectures to the visiting delegates to Bioconversion Research and Education Center (BREC) to educate them about UGA's research program on algae biofuels.
- Guided tours to UGA students visited BREC facility as part of their field trip studies.

*Durban University of Technology, South Africa (2006 to 2008)*

- Industrial microbiology class lectures delivered to national diploma and undergraduate students.
- Assisted advisor in setting exams and marking student's responses in that course.

*Guru Nanak Dev University, India (1999 to 2006)*

- Teaching of undergrad and master courses in Microbial physiology and biochemistry
- Assisted advisor in practical classes related microbial technologies in bioremediation.
- Assisted in conducting exams and marking papers as an examiner.

## Research Grants

2011-2015 ***Co-Investigator:*** **Department of Defense, USA**. University of Puerto Rico-UGA Partnership for a Research Center of Excellence in Renewable Energy. (UGA portion $1.28 million; Total $4.3 million)

2011-2012 ***Co-Investigator:*** **Dalton Utilities Inc. and Appalachian Research Commission, USA**. Comparison of suspended and attached growth cultures for algae cultivation. (UGA portion $ 100,000; Total $200,000).

2008-2012 **Co-Investigator**: eThekwini Municipality, South Africa. Production of biodiesel from microalgae using pilot and full scale raceway processes. (ZAR 3.0 million ≈ USD 370,000). I had to leave this project because of job switching to Australia.

## Awards & Honors

2005-2006 Senior Research Fellowship, Council of Scientific and Industrial Research (CSIR), Government of INDIA

1999-2005 Junior Research Fellowship, Guru Nanak Dev University, Amritsar India

2001 Qualified National Eligibility Test for Lectureship, University Grants Commission, Government of INDIA

2000 Qualified Graduate Aptitude Test for Engineering (**GATE**) for Research Fellowship, Indian Institute of Technology, Khargpur, India

## Publications

*Patent Disclosure:*

***Provisional Patent pending*** (2012). Algal floway (AGF) system for economical and efficient harvesting of algae biomass. Inventors: **Manjinder Singh** and K.C. Das.

*Books*

1. **Singh, M**. (2010). Microbial Decolorization and Degradation of Azo dyes- An approach to Biotreatment of Textile and dye manufacturing Industries wastewaters. Lambert Academic Publishing Gmbh & Co. KG, Germany.

*Book Chapters*

2. **Singh, M**., Das, K.C. (2012). Low cost Nutrients for cultivation of algae. In: Algal Biorefinaries Vol 1; Edited by Bajpai, R. K., Prokop, A., Zappi, M. E. Springer, USA. (Submitted to editor).
3. **Singh, M.**, Shukla, R., Das, K.C. (2012). Harvesting of Microalgal Biomass-methods and energy utilization. In: Biotechnological applications of microalgae: biodiesel and value added products. Edited by: Bux, F., Taylor & Francis, USA. (Submitted to editor)
4. Chinnasamy, S., Rao, P.H., Bhaskar, S., Babu, R.A., **Singh, M**. (2011). Algae- A Novel Biomass Feedstock for Biofuels. In: *Microbial Biotechnology: Energy and Environment*. Edited by: Rajesh Arora, CABI, UK.

*Journal Articles*

5. Viswanathan, T., Mani, S., Das, K. C., Chinnasamy, S., Bhatnagar, A., Singh, R. K., **Singh, M**. 2012. Effect of cell rupturing methods on the drying characteristics and lipid compositions of microalgae. *Bioresource Technology*, 126**,** 131-136
6. Mattos, E.R., **Singh, M.**, Cabrera, M.L., Das, K.C. (2012). Effects of inoculum physiological stage on the growth characteristics of *Chlorella sorokiniana* cultivated under different $CO_2$ concentrations. Applied Biochemistry and Biotechnology. (*In-press*)
7. **Singh, M**., Reynolds, D.L., Das, K.C. (2011). Microalgal system for treatment of effluent from poultry litter anaerobic digestion. Bioresource Technology, 102, 10841-10848.
8. Bhatnagar, A., Chinnasamy, S., **Singh, M**., Das, K.C., (2011). Renewable biomass production by mixotrophic algae in the presence of various carbon sources and wastewaters. Applied Energy**,** 88, 3425-3431.
9. Putt R, **Singh M**, Chinnasamy S, Das K.C., (2011). A low-cost system for efficient carbonation of high-rate algae pond water to enhance biomass productivity. Bioresource Technology 102 (3), 3240-3245.
10. Chinnasamy, S., **Singh, M**., Das, K.C., (2010). Microalgae technology for integrated waste management with bioenergy production. In: Proceedings of the International Conference on Bioengineering. SRM University, Chennai, India. July 29-31.
11. Das, K.C., **Singh, M**., Garcia-Perez, M., Chinnasamy, S., (2010). Biorefinery technologies – an overview. In: Proceedings of the International Conference on Bioengineering. SRM University, Chennai, India. July 29-31.
12. Harun R, **Singh M**, Forde G. M, Danquah M. K., (2010). Bioprocess engineering of microalgae to produce a variety of consumer products. Renewable and Sustainable Energy Reviews 14, 1037-1047.
13. **Khehra M S**, Saini H S, Sharma D K, Chadha B S and Chimni S S (2006). Biodegradation of an Azo dye Acid Red-88 by an anoxic-aerobic sequential bioreactor. **Dyes and Pigments, 70(1):** 1-7.

14. **Khehra M S**, Saini H S, Sharma D K, Chadha B S and Chimni S S (2005). Comparative studies on potential of consortium and constituent pure bacterial isolates to decolorize azo dyes. **Water Research, 39(20):** 5135-5141.
15. **Khehra M S**, Saini H S, Sharma D K, Chadha B S and Chimni S S (2005). Decolorization of various azo dyes by bacterial consortium. **Dyes and Pigments, 67**: 55-61.
16. Sharma D K, Saini H S, **Singh M**, Chimni S S and Chadha B S. (2004). Isolation and characterization of microorganisms capable of decolorizing various triphenylmethane dyes. ***Journal of Basic Microbiology,* 44(1)**: 59-65.
17. Sharma DK, Saini HS, **Singh M**, Chimni SS and Chadha BS (2004). Biodegradation of Acid Blue-15, a textile dye by an up-flow immobilized cell bioreactor. ***J. Ind. Microbiol. Biotechnol.*, 31**: 109-114.
18. Sharma DK, Saini HS, **Singh M**, Chimni SS and Chadha BS (2004). Biological treatment of textile dye Acid Violet-17 by bacterial consortium in an up-flow immobilized cell bioreactor. ***Lett. Appl. Microbiol.***, **38**: 345-350.
19. Sharma DK, Saini HS, **Singh M**, Chimni SS and Chadha BS (2004). Biotreatment of simulated textile dye effluent containing malachite green by an up-flow immobilized cell bioreactor. ***W. J. Microbiol. Biotechnol.*, 20**: 431-434.
20. **Singh M,** Chadha BS and Saini HS (2002). Studies on the prevalence of thermophilic actinomycetes in the environment using aeromicrobiological sampling devices. ***Journal of Ecobiology*, 14(4):** 261-266.

*Conference presentations*

1. Mattos, E.R., **Singh, M.**, Das, K.C. (2012). *Scenedesmus bijuga* oxygen evolution at different culture concentration induced by different monochromatic wavelengths. Growing the Bioeconomy: Social, environmental and Economic implications, October 2-5, **Alberta, Canada**.
2. **Singh, M.**, Claxton R.L., Das, K.C. (2012). Nutrient recycling from waste resources for algae cultivation: necessity, not a choice. 2nd International conference on Algal Biomass, Biofuels & Bioproducts, June 10-13, **San Diego, USA**.
3. **Singh, M**., Claxton, R.L., Putt, R., Das, K.C. (2011). Making algae cultivation in open ponds economical and efficient. 1st International conference on Algal Biomass, Biofuels & Bioproducts, July 17-20, **St. Louis, USA**.
4. **Singh M**, Das, K.C. (2010). Algae Biorefinary- Potential and Challenges of Waste Processing. 2010 Sino-U.S. Environmental Protection and Energy Summit & Expo, April 24-25, **Atlanta, USA**.
5. **Singh M**, Chetty V and Bux F. (2008). Production of Biodiesel from Microalgae. 5th IWA Leading-Edge Conference, June 1-4, **Zurich, Switzerland**.
6. **Singh M**, Chiya M, and Bux F. (2008). The potential of microalgae isolated from wastewater treatment plants to be used as feedstock for biodiesel production. WISA 2008 biennial conference, May 18-22, Sun City Hotel and Convention Centre, **South Africa**. http://www.ewisa.co.za/literature/files/2008_054.pdf
7. Chetty V, **Khehra M S**, Chiya M, Fick C and Bux F. (2008). Isolation and characterization of potential lipid storing microalgae for production of biodiesel. Bio-08, January 21-25, **Grahamstown, South Africa**.

8. Saini H S, **Khehra M S**, Chimni S S and Chadha B S. (2005). Development of sequential anoxic-aerobic reactor using consortium of adapted strains isolated from sites polluted with textile processing industry (TPI) wastes. Microbial Diversity 2005, International conference. April 16-18, **New Delhi, India**.
9. **Khehra M S**, Saini H S, Chadha B S and Chimni S S. (2005). Biotreatment of simulated textile wastewater using anoxic-aerobic sequential bioreactor. 5th International exhibition and conference on environmental technology. February 3-6, **Athens, Greece**. http://library.tee.gr/digital/m2045/m2045_khehra.pdf
10. **Khehra M S**, Saini H S, Chadha B S and Chimni S S. (2005). Biological treatment of synthetic textile wastewater using anoxic-aerobic sequential bioreactor. International Conference on Environmental Science and Technology. January 23-26, **New Orleans, USA**.
11. Saini H S, **Singh M**, Sharma D K, Chimni S S and Chadha B S (2004). Development of efficient microbial inoculla for degradation/decolorization of textile dyes. IUPAC International Conference on Biodiversity and Natural Products: Chemistry and Medical Applications, **New Delhi, India**.
12. **Singh M**, Saini H S Sharma D K, Chadha B S and Chimni S S (2002). Sequential anoxic-aerobic batch reactor for biodegradation of azo dyes. National Conference on Soil Contamination and biodiversity, **Lucknow, India**.
13. Sharma D K, **Singh M**, Saini H S, Chadha B S and Chimni S S (2002). Development of bioreactors for treating effluents of textile dyeing units. National Conference on Soil Contamination and biodiversity, **Lucknow, India**.
14. Saini H S, Sharma D K, **Singh M**, Chadha B S and Singh S (2001). Designing of bioreactor(s) for continuous treatment of textile dying industry effluents. International Conference on New Horizons in Biotechnology, **Thiruvanthapuram, India**.
15. Sharma D K, **Singh M**, Saini H S, Chadha B S, Chimni S S and Singh S (2000). Development of consortia for the treatment of Triphenylmethane (TPM) dyes containing effluents. 41st Annual Conference of Association of Microbiologists of India, **Jaipur India**.
16. **Singh M**, Sharma D K, Saini H S, Chadha B S, Chimni S S and Singh S (2000). Designing of anaerobic-aerobic sequencing batch reactor for biodegradation of azo dyes. 41st Annual Conference of Association of Microbiologists of India, **Jaipur India**.

*Invited lectures/seminar*

1. **Singh, M**. A New Industrial Paradigm: Cultivation and Processing of Microalgae into Valuable Consumer Products. International Colloquium on Biotechnology, 27-28, November 2009, DAV College, Jalandhar, India.
2. **Singh, M**. Renewable energy from carbon dioxide: Process engineering to obtain biodiesel from algae. Seminar, 10, August 2009, DAV College, Amritsar, India.

**Under review articles**

1. Bioactivity assessment of cyanobacterial filtrate on micro alga *Chlorella vulgaris in* treated industrial wastewater.
2. Modulation of illumination intensity and $CO_2$ bubbling in photobioreactors for enhancing biomass yield of *Scenedesmus bijuga*

3. Utilization of lignocellulosic hydrolysates for mixotrophic algae biomass production
4. In-situ nutrient extraction and algae cultivation from poultry litter in open raceways.

## Professional Affiliations

- Editorial Review Board, Scientific Journals International (SJI), USA**.**
- Editorial Board Member, British Journal of Applied Science & Technology.
- Associate editor, International Journal of Chemical Research, Bioinfo Publications, India.

*Journal Reviewer:*

- Algal Research
- Bioinfo Publications
- Bioresource technology
- Biotechnology Advances
- Biotechnology Progress
- Brazilian Journal of Chemical Engineering
- Chemical Engineering Journal
- Chemical Engineering Research and Design
- Electronic Journal of Biotechnology
- Journal of Applied Phycology
- Journal of Environmental Management
- Letter in Applied Microbiology
- Process Biochemistry
- Recent Patents on Food, Nutrition and Agriculture
- Renewable and Sustainable Energy Reviews
- Water Research

*Grant Reviewer:*

- National Agency of Research (ANR), France
- Australian Academy of Technological Sciences and Engineering, Govt. of Victoria, Australia.
- National Research Foundation (NRF), South Africa.
- Department of Energy, USA

*Thesis/Dissertation supervision*

Masters:

Shubnum Mustapha, 2007. Microbial Degradation of Polychlorinated biphenyls. Durban University of Technology, South Africa.

Senior Thesis:

Andrew Yonkofski, Spring 2011. Optimization of *Corbicula fluminea*-Microalgae Biofilter for Poultry Litter. UGA

Ph.D :

Virthie Bhola, 2010-current. The Mitigation of Carbon Dioxide from Flue Gas using Indigenous Microalgae. Durban University of Technology, South Africa

## Public Service & Outreach

*Judge*:

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| Annual Biomedical Research Conference for Minority Students, Hosted by American Society of Microbiology | 2012 |
| Georgia State Science and Engineering Fair | 2011onward |
| Georgia Junior Science and Humanities Symposium | 2011 onward |
| South African Society of Microbiology, annual symposium | 2007-2008 |

*University Committees & Organizations*:

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|---|---|
| Member- American Society of Microbiology | 2011 onward |
| Bioenergy Systems Research Institute (UGA) | 2010 onward |
| Executive Committee, Postdoctoral Association, UGA | 2011-2012 |
| Member, National Postdoctoral Association, USA | 2011-2012 |

Guest lecture, 'Glimpses from my voyage of life'. Office of International Education (OIE), University of Georgia, 2010.

## Links to media and research citation of my work

http://news.uga.edu/releases/article/tropical-energy-uga-and-university-of-puerto-rico-create-algae-biofuels-cen
http://athens.patch.com/articles/uga-helping-grow-algae-for-renewable-biofuel#photo-8745549
http://clubs.engr.uga.edu/gradclub/student-spotlight/manjinder-singh
http://www.dut.ac.za/node/1174
http://www.iol.co.za/index.php?click_id=13&set_id=1&art_id=vn20080417055727488C575159
http://www.bulletins-electroniques.com/vigies/viewtopic.php?pid=3950
http://www.tribuneindia.com/2009/20090815/aplus.htm#6
http://top25.sciencedirect.com/subject/energy/11/journal/renewable-and-sustainable-energy-reviews/13640321/archive/26