
Gurmeet Singh

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Summary

Scientist, Inventor and Innovator working in academia & FMCG Research & Development for 25 years. Strong interest in working on solutions of problems relevant to society & environment sustainability in the Beverages Industry.

Competencies

- Creating new programs that fuel disruptive innovations, sustainable alternatives and impact society at large
- Creating proprietary technology & taking bench-scale inventions to factory scale & converting technology into innovations in market
- Industry-academia network and creating interdisciplinary teams to solve complex problems
- Love for teaching and guiding/mentoring students for research
- Creative problem solving and out of box thinking
- Working in a global environment – 16 years in India, 3 years in UK, 3 years in USA.
- Leading global and multi-functional teams

Employment History

R & D Director for Disruptive Innovations Unilever R &D Sep 2016 to present
Program Leader for Tea – Disruptive Innovations with a scope ranging from the field to consumers. Examples include ‘smart & future proof agri’ integrating genomics, weather, satellite & soil data, factory 4.0, new packaging materials and new occasions, formats & benefits of tea.

R & D Director for Core Innovations Unilever R &D Apr 2013 to Sep 2016
Program Leader for Core Tea Technologies and Future Proofing with project teams spread across India & UK R & D laboratories. Developing technologies for innovations linked to consumer benefit platforms as well as technologies that allow constructing products at radically lower costs.

Discover Category Leader Unilever R & D Oct 2010 to Mar 2013
Responsible for developing long-term innovation funnel and technology roadmap for the Beverages category comprising of tea (main focus) and soy drinks. Defined discover research program for beverages for teams across India, UK, Netherlands and China working on areas from developing novel process technologies, proving health benefits through bioassays and human clinical studies, developing novel products. Seconded to UK as part of this role.

Genesis Field Leader Unilever R & D Bangalore Mar 2009 to Sep 2010
Lead a Global Research Program to develop technologies and applications for tea and tea based ingredients for tea & personal care products – tea beyond tea. Lead a global team of multidisciplinary scientists across Unilever’s labs in India, China & Netherlands.

Research Scientist Unilever R & D Bangalore Dec 1998 to Mar 2009
Lead tea process science in Unilever R&D. Developed new drying, separations and fermentation processes and re-invented a 100-year old tea process for delivery of higher colour, taste, aroma and health actives.

Academia Assistant Professor at Dept. of Biochemical Eng. January 1998
Indian Institute of Technology DELHI to December 1998

Assistant Professor at Dept. of Chemical Eng. May 1995
The Pennsylvania State University to December 1997

Research focus on bioreactor designs and scale-up of plant tissue cultures.

Qualifications

<u>PhD.- ChE</u>	The Pennsylvania State University, USA	May 1992 to Feb 1995
<u>M.S.- ChE</u>	The Pennsylvania State University, USA	August 1989 to May 1992
<u>B.Tech.- ChE</u>	Indian Institute of Technology, Delhi, India	August 1985 to May 1989

PhD Thesis Fungal Elicitation of Plant Root Cultures - Application to Large-scale Reactors for Production of Secondary Metabolites (1995)

MS Thesis Predictions of Thermal Properties of Petroleum and Coal Liquid Fractions
The work was funded by American Petroleum Institute and correlations developed were used in Industry data-bases. (1992)

Teaching Taught Chemical Engineering courses to over 1500 undergraduate and graduate in 4 years of academic carrier at Pennsylvania State University, USA and Indian Institute of Technology, Delhi.

Books Plant Cell and Tissue Culture for Food Ingredient Production, Fu TJ, Singh G, Curtis WR, (eds)
Plenum Publishers, New York, 1998

Symposiums Organized Invited to organize & chair a session on "Plant cell and tissue culture for "food ingredient production" at Institute of Food Technologists Annual Meeting, New Orleans, June 22-26, 1996

Invited to organize and chair a 3 day international symposium on plant tissue culture at the American Chemical Society annual meeting, San Francisco, April 13-17, 1997.

Awards

Best student teacher award	1994
Best faculty award in Chemical Engineering Department	1996
Most Impactful Foods & Beverages Patent Award - Unilever	2006

Publications 19 Publications in international journals and books

Presentations 20+ Presentations at National & International conferences and symposia

Patents 24 Patents filed, granted across 30 countries.

List of Patents

#	Title	Application Date	Publication Number
1	IMPROVED PROCESS FOR TEA MANUFACTURE	19-Sep-2005	WO2007039018
2	A PROCESS FOR RECOVERING VOLATILE COMPOUNDS	06-Nov-2007	Refiled as F2063
3	A PROCESS FOR RECOVERING VOLATILE COMPOUNDS	14-Dec-2007	WO2009077189
4	A PROCESS FOR RECOVERING VOLATILE AROMA COMPOUNDS FROM A TEA MATERIAL	28-Dec-2007	WO2009083418
5	A PROCESS FOR RECOVERING VOLATILE AROMA COMPOUNDS FROM A TEA MATERIAL	28-Dec-2007	WO2009083420
6	PROCESS OF EXTRACTION OF SOLUBLE SOLIDS FROM TEA MATERIAL	27-Feb-2008	
7	AN AROMATIZED TEA MATERIAL	07-Dec-2009	WO2011069832
8	A PROCESS FOR THE RECOVERY OF VOLATILE AROMA COMPOUNDS FROM VEGETABLE MATERIAL	07-Dec-2009	WO2011069788
9	A PROCESS FOR PREPARING A TEA PRODUCT	22-Dec-2009	WO2011076519
10	A PROCESS OF PREPARATION OF TEA	04-Jun-2010	WO2011151237
11	A TEA PRODUCT	24-Nov-2010	WO2012069323
12	A PROCESS FOR NOVEL TEA MANUFACTURE	26-Nov-2010	WO2012069295
13	A PROCESS FOR PRODUCING A NOVEL TEA PRODUCT	16-Dec-2010	WO2012079916
14	A PROCESS FOR PRODUCING A TEA PRODUCT	20-Dec-2011	WO2013092153
15	A PROCESS FOR AROMA RECOVERY FROM TEA	24-Apr-2012	WO2013160131
16	A PROCESS FOR PRODUCING A TEA PRODUCT	27-Apr-2012	WO2013160097
17	A PROCESS FOR PRODUCING A TEA PRODUCT	06-Dec-2013	WO2015082191
18	A TEA PRODUCT AND PROCESS FOR PREPARING THE SAME	01-Oct-2014	WO2016050489
19	A PROCESS OF PRODUCING A TEA PRODUCT	29-Apr-2015	WO2016173810
20	A PROCESS OF PRODUCING A TEA PRODUCT	15-Oct-2015	WO2017063906
21	A PROCESS OF PRODUCING A TEA PRODUCT	02-Nov-2015	WO2017076612

22	A process for manufacturing a leaf tea product	15-Aug-2016	Filed; To be published
23	Heat Treatment (Prolonged Incubation	15-Aug-2016	Filed; To be published
24	A PROCESS FOR PRODUCING A TEA PRODUCT	06-Sep-2016	Filed; To be published

List of Publications

Jha, Durgesh K., Dhekne, Pallavee P., Yadav, Geeta U., Patwardhan, Ashwin W. and Singh, Gurmeet 'Characterisation & evaluation of tea bag papers', draft submitted to Unilever for internal clearance for external publication, to be submitted to J. Food Sci & Technology.

Raosaheb A. Farakte, Geeta Yadav, Bhushan Joshi, Ashwin W. Patwadhan and Gurmeet Singh Effect of brewing temperature, tea types and particle size on infusion of tea components. Accepted for publication in International Food Research Journal 2017

Yadav, Geet U., Joshi, Bhushan S., Patwardhan, Ashwin W. and Singh, Gurmeet 'Swelling Kinetics of Tea in Tea Bags', Journal of Food Science & Technology, 54 (8): 2474-2484, 2017

Raosaheb A. Farakte, Geeta Yadav, Bhushan Joshi, Ashwin W. Patwadhan and Gurmeet Singh 'Modeling Tea Infusion Kinetics Incorporating Swelling Kinetics' International Journal of Food Engineering 13(2) 2017

Bhushan S.Joshi, RaosahebA.Farakte, GeetaU.Yadav, AshwinW.Patwardhan, Gurmeet Singh 'Swelling kinetics of tea in hot water' J Food Sci Technol 53(1):315–325, 2016

Raosaheb A. Farakte, Geeta Yadav, Bhushan Joshi, Ashwin W. Patwadhan and Gurmeet Singh 'Role of Particle Size in Tea Infusion Process', Int. J. Food Eng. 2016; 12(1): 1–16

K. M. Vasantha, Lokesh Basavararaju, Sreeramulu Guttapadu, Gurmeet Singh, T. G. Prasad, 'Cuticular Wax Content on Tea Leaves: Changes with Leaf Development, Clonal Variations and its Relationship to Cuticular Transpiration', International Journal of Tea Science, Vol 11, No 3&4 (2015)

Karishma Rajbhar, Himanshu Dawda, Usha Mukandan, Purna Venkatesh, Gurmeet Singh, Sreeramulu Guttapadu and Vilas Sinkar, 'Polyphenols: Methods of Extraction', Sci. Revs. Chem. Commun 5(1), 2015, 1-6, 2015

Payal Gupta, Kuldeep Mamtani, Gurmeet Singh, Sreeramulu Guttapadu 'Thermal inactivation kinetics of polyphenols oxidase from tea', International Journal of Tea Science, Vol 10, No 3&4 (2014)

Kanani D. M., Nikhade B. P., Balakrishnan P., Singh G. and Pangarkar V. G. 'Recovery of Valuable Tea Aroma Components by Pervaporation', Ind. Eng. Chem. Res., 42 (26), pp 6924–6932, 2003

Mukundan U, Bhagwat V, Singh G and Curtis W R (2001). Integrated recovery of pigments released from red beet hairy roots exposed to acidic medium. Journal of Plant Biochemistry and Biotechnology, 10, 67-69, 2001

Singh, G., "Bioreactor design for plant tissue culture – a simple approach to culturing plant cells at a large-scale" in Proceedings of National Symposium on Bioprocessing and rDNA Technology, Ed. Bihari, V., 1998.

Singh, G., "Elicitation - manipulating and enhancing secondary metabolite production" in Plant Cell and Tissue Culture for Production of Food Ingredients and Additives, Eds. Fu, T. J., Singh, G., Curtis, W. R., Plenum Books, 1998.

Mukundan, U., Bhide, V., Singh, G., Curtis, W. R., 'pH mediated release of betalains from transformed root cultures of Beta vulgaris L', Applied Microbiology and Biotechnology, 50(2), 241-245, 1998.

Singh, G., Gavrieli, J., Oakey, J. S., Curtis, W. R., 'Interaction of methyl jasmonate, wounding, and fungal elicitation during sesquiterpene induction in Hyoscyamus muticus root cultures', Plant Cell Reports, 17, 391-395, 1998.

Singh, G, 'Reactor design for plant cell culture of food ingredients and additives' Food Technology, 51 (11) 62-66, 1997.

Singh, G., 'Application of fungal elicitation for enhancing production of secondary metabolites in plant roots cultured in large-scale bioreactors' Hairy Roots, Ed. Doran, P., 1996

Singh, G., Curtis, W. R., 'Growth of cell suspensions and hairy root culture on Hyoscyamus muticus on different carbon

sources' *Plant Physiology (Life Sciences Advances)*, 13, 163-168, 1994.

Singh, G., Reddy, G. R., Curtis, W. R., 'Use of binding measurements to predict elicitor dosage requirements for secondary metabolite production from root cultures' *Biotechnology Progress.*, 10, 365-371, 1994.

Singh, G., Curtis, W. R. 'Reactor design for plant root culture culture' in *Biotechnological Applications of Plant Culture*, Eds. Shargool, P. D., Ngo, T.T., 185 - 206, CRC Press, Boca Raton, FL, 1994.

Singh, G., Curtis, W. R. 'Reactor design for plant cell suspension culture' in *Biotechnological Applications of Plant Culture*, Eds. Shargool, P. D., Ngo, T.T., 153 - 184, CRC Press, Boca Raton, FL, 1994.

Singh, G., Reddy, G. R., Curtis, W. R., 'Phosphorus uptake and utilization by hairy root cultures of *Hyoscyamus muticus*' *Plant Physiology (supplement)*, 99, 85-86, 1992

Invited Lectures, Seminars & Symposia

Singh G. Roundtable on Sustaining Excellence and Relevance in an Organisation, NIAS & Niti Aayog, National Institute of Advanced Studies Campus, Bengaluru, India 2017

Singh G. 'Innovation Journey of Tea – From Trends to Market, Ericsson Global Centre Bengaluru, India 2017

Singh G. 'Tea and Inclusive Manufacturing & Innovations', Inclusive Manufacturing Forum, NIAS, Bengaluru, India 2017

Singh G. 'Innovation Framework for Tea' Indian Institute of Plantation Management, Bengaluru, India, 2016

Singh G. 'Future Tea Factory' Indo-UK Manufacturing Futures Symposium, Bengaluru, 2016

Singh G. 'Corporate Research: A Beverages Perspective' Symposium on Frontiers of Chemical Engineering Research, Indian Institute of Technology, Kanpur, 2016

Singh G. 'Sustainable Processing in Tea' MS Ramaiah Institute of Technology, Bengaluru, 2016

Singh G. 'Biotechnology Applications in Tea - Addressing Sustainability in Tea Industry, Conference on Sustainability & Biotechnology, PFNDAI, Mumbai, 2015

Singh.G, 'Processing of Tea' Nottingham University, UK, 2012

Singh G., "Tea Processing" MS Ramaiah Insitiute of Technology, Bangalore, India, 2008

Singh G., "Chemical engineering applications in food processing" BMS College of Engineering, Bangalore, India, 2008

Singh G., Ganguli S., Jublot L, Narayanan V. "Flavour formation in Tea" Unilever Flavour Symposium, Vlaardingen, Netherlands, 2008

Singh G., "Scale-up of bioreactors for plant tissue culture", University of Hyderabad, Hyderabad, India, 1999.

Singh, Gurmeet, "From green plants to chemical plants, a case for plant tissue culture" at Indian Institute of Technology, New Delhi, February 1998

Singh, Gurmeet, "Plant tissue culture for production of phytochemicals" at Hindustan Lever Research Centre, Bangalore, September 1998

Singh, G., National Symposium on Plant issue Culture and Medicinal Plants, February, 1998, New Delhi

Singh, G. National Symposium on Bioprocessing and rDNA Technology, March, 1998, Lucknow, UP

Workshop on Biosafety Issues Emanating from Use of GMOs, Biotech Consortium India Ltd., September 1998, New Delhi, India

Singh, G., American Chemical Society, Annual Meeting, April 1997, San Francisco, CA

Singh, G., Curtis, W. R., American Institute of Chemical Engineers, Annual Meeting, November, 1997, Los Angeles, CA