RAJKUMAR RATHINAVELU

Lead Scientist, Life Science & Technology Center, ITC Ltd

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Personal Info:
Date of Birth: **29 May 1972**
Citizenship: **Indian**

CAREER OBJECTIVE

To serve in full project management lifecycle utilizing my integrative experience over the last **16 years** in **digital technologies** particularly, **bioinformatics, biostatistics, molecular plant breeding, crop development** involving **automation**, genome wide **data mining** of biological databases and automation, annotation and management of heterogeneous **Big datasets.** Keen in implementation of **digital technology** in the field of **Agriculture** utilizing my demonstrated expertise in **development GUIs** and **DRONE Agricultural technologies.**

EDUCATION

Ph. D - Genetics and Plant Breeding - Tamil Nadu Agricultural University, India ***1999***

RESEARCH EXPERIENCE (16 YEARS)

Lead Scientist	Genomics based Crop improvement	**Life Science & Technology Center**, ITC Ltd, IN	***2008 -Present***
Post-doctoral Scientist	Bioinformatics and Computational Biology	**University of North Carolina (UNC),** Chapel Hill, USA	***2006 – 2008***
Fellow, Informatics	Bioinformatics and Computational Biology	**International Center for Science and High Technology (ICS-UNIDO)**, Italy	***2005 - 2006***
Post-Doctoral Associate	Bioinformatics and Molecular Biology	**University of Trieste (UNITS),** Italy	***2002-2006***
Post-Doctoral Fellow	Molecular Tree Breeding	**Centre for Cellular and Molecular biology (CCMB),** IN	***2000 – 2002***
Senior Research Fellow	Molecular Breeding	**Centre for Plant Molecular Biology (CPMB)**, TNAU, IN	***1999-2000***

POSITIONS HELD/HOLDING

Domain Head – Bioinformatics and Biostatistics	**Life Science & Technology Center**, ITC Ltd, IN	***2012 - Present***
Lead Scientist – Genomics and Predictive Breeding	**Life Science & Technology Center**, ITC Ltd, IN	***2012 - Present***

Research Scientist – Genomics	**Life Science & Technology Center**, ITC Ltd, IN	***2010 - 2012***
Associate Scientist – Plant Molecular biology	**Life Science & Technology Center**, ITC Ltd, IN	***2008 - 2010***
Developer and Administrator of **CoffeeDNA**: A comprehensive database on coffee genomics	**University of Trieste (UNITS),** Italy	***2002 to 2012***
Co-ordinator – Bioinformatics (WG-6)	**International Coffee Genome Network (ICGN),** France	***2004 to 2010***
Post doctoral Scientist	**University of North Carolina (UNC),** USA	***2005-2007***
Fellow, Informatics	**International Center for Science and High Technology (ICS-UNIDO)**, Italy	***2005-2006***
ICTP – Fellow	**International Centre for Theoretical Physics (ICTP),** Trieste, Italy	***2002-2005***
Post doctoral Associate	**University of Trieste (UNITS),** Italy	***2002-2006***
Post Doctoral Fellow	**Centre for Cellular and Molecular biology (CCMB),** IN	***2000-2002***
Senior Research Fellow	**Centre for Plant Molecular Biology (CPMB)**, TNAU, IN	***1999-2000***
Fellow - ICFRE	**Forest College and Research Institute (FCRI)**, TNAU, IN	***1996-1999***
Fellow - ICAR	**Centre for Advanced Studies in Plant Breeding and Genetics (CPBG),** TNAU, IN	***1994-1996***

GRANTS /AWARDS /MEDALS

- **ICS-UNIDO Fellow Grant** – by International Centre for Science and High Technology, Trieste, Italy -2004
- **ICTP Fellow Grant** – by **Nobel laureate, Abdus Salam** International Centre for Theoretical Physics, Trieste, Italy -2002
- **Dr. M.S. Swaminathan Award (Gold Medal)** –Best student in Plant Breeding and Genetics – by Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, India – 1999
- **Dr. R. Appadurai Award (Gold Medal)** – Best student in Population Genetics and Biometrics – by Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, India – 1999
- **Dr. K. Ramiah Award** – **(Gold Medal)**- Best student in Plant Breeding and Genetics – by Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, India – 1999
- **Dr. Mercy Ponnaiah Award and B.W.X. Ponnaiah Award (Gold Medal)** - Best Research Worker in Plant breeding and Genetics – by Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, India – 1999

- **ICFRE-GOI Senior Research Fellow Award** – by Indian Council of Forestry Research and Education, India - 1996
- **Outstanding Science Exhibit Award** – National Science Day, Tamil Nadu Agricultural University, India – 1995
- **Junior research Fellow Award** – by Indian council of Agricultural Research, India – 1994

RESEARCH SKILLS

- ***Digital technology***
  - **BIOME**: Designed and implemented GUI for documentation, analysis of Cropping trails and well versed in dynamic server side scripting
  - **Silvi Brain Center***:* Designed the DB schema and GUI for integrated knowledge pool for **genotype – phenotype connections** for **precision breeding.** Silvi Brain Center is also designed as Tablet / **mobile** based technology for instant solution to complex problems. - – *currently under implementation in LSTC*
  - **DRONE Agriculture –** Designed project for Soil pattern analysis; phenotype measurement, cropping pattern using Aerial Agriculture Drone technology – *currently under implementation – LSTC.*
  - Designed and implemented "**web based - R**" and developed numerous modules for biostatistics to enable researchers to use the Big datasets.

- ***Bioinformatics and Computational biology***

  - Competent in **PERL/BioPERL** to handle genome wide data involving annotation, curation, synteny analysis, gene finding, systematics and designing/implementing bioinformatics pipelines.
  - Proven experience in handling **Apache** (SSI) server, **MySQL, PostgreSQL** databases using **PHP/PERL** as evident from online database**: CoffeeDNA,** a comprehensive database on coffee genomics.
  - Vast experience in **data mining** of biological databases and handling large datasets including development of **web based graphical interface** for heterogeneous datasets.
  - Languages: **PERL, PHP, JavaScript, SQL, CSS**; Well know Protocols: **HTTP, SSH, FTP, POP**; Libraries: **BioPERL, GD, iMagik, GTK+, POSIX, DBI** and numerous PERL modules; File formats: **HTML, XML, GAME, GFF, GenBank, FASTA, SVG, TTF,** etc
  - Designed/implemented numerous **CMS**, **Wiki systems,** several **GMod** (such as **gBrowse, cMap**) components inter/intranet for laboratory and work management
  - Competent in UNIX Server/ system administration.

- ***Molecular Biology***

  - Led **Genome sequencing** projects of **Tobacco and Eucalyptus** and completed successfully with the complete project life-cycle including development and use of markers in for practical informed selection.
  - Handled various genome wide genotyping projects including **DArT systems** in Eucalyptus, Coffee, Casuarina etc
  - Handled various gene mining projects involving **transcriptome of** Casuarina, Coffee and Eucalyptus and experience in handling expression data from microarray experiments
  - Involved in **molecular characterization** and **genome systematics** in *Oryza, Pterocarpus* and *Coffea Eucalyptus, Casuarina and Corymbia* species using various marker systems DArT, SNPs, AFLP, ISSR, SSR, ITS etc and having proficiency in respective PCR based techniques.
- ***Embryology and Tissue Culture***

- Investigated in Rice polyembryony and in vitro propagation of *Pterocarpus*, Corymbia, Eucalyptus and having expertise in **histological**, **embryological** and **tissue culture** work.

SCIENTIFIC ACHIEVEMENTS

- ***Digital technology*** ***2015***
  - **Gendrom** : Designed and implemented an integrated resource for genomics in Casuarina, Eucalyptus and Tobacco involving **Blast, cMAP, gBrowse, Web - R** and **Wiki**, which are integrated at back-end DB schema level. - *Running*
  - **Silvi Brain Center** : Designed and developed the DB schema and GUI for integrated knowledge pool for genotype – phenotype connections for precision breeding. Silvi Brain Center is also designed as Tablet / mobile based technology for instant solution to complex problems. - – *currently under implementation in LSTC*
  - **DRONE Agriculture –** Designed project for Soil pattern analysis ; phenotype measurement, cropping pattern using Aerial Agriculture Drone technology – *currently under implementation – LSTC.*
  - **Biome :** Designed, developed and implemented an integrated documentation application for heterogeneous datasets of Cropping trials. Biome also acts as annotation tool in genomics. – *Running.*

- ***Bioinformatics and computational Biology***

  - **Genome sequencing of Tobacco and Eucalyptus**: Developed numerous pipelines for sequence handling, assembly, annotation, integration of physical and genetic map, development of genome wide SSRs, EPIC markers, COS markers and use of them in microarray for informed selections in various species. ***2014+***
  - **Integration of physical and genetic mapping**: Involved in developing an integrated physical and genetic map of Mimulus, Tobacco and Eucalyptus. ***2007+***

  - **Microsynteny of Mimulus and Arabidopsis**: Currently involved in the microsynteny analysis between Mimulus and Arabidopsis to demonstrate the synteny/genome wide variability in Mimulus. The synteny analysis involves development of complex pipelines, annotation, BLAST, genome wide alignment, synteny analysis etc. ***2007***

  - **Open source Online Genomics database**: Developed and currently administrating **CoffeeDNA** [http://www.coffeedna.net]: A query based user-friendly web-database driven by MySQL database. CoffeeDNA has been considered to be a popular online resource among coffee researchers. CoffeeDNA is the first open source resource coffee genomics database available online. ***2004***

  - **Nucleotide submissions in public databases:** Whole genome transcriptome of Casuarina; SSRs of various species, mentioned in this CV ***2002+***

- ***Informed Precision Breeding***

  - **Biostatistical selection models:** Developed marker based **biostatistical selection models** in eucalyptus for **gene based markers** for balanced selection of desirable /uncorrelated traits. The model is well validated and currently being using across the organizations for informed selections. ***2012+***
  - **Breeding without breeding:** Unique seed orchard model has been developed using marker based technology and being implemented for high quality seed production in Eucalyptus and Casuarina species in various trials. **BwB** model is also implemented by ITC business for large scale seed ***2010+***

production.

- **Induction of Coppicing:** Discovered a method for coppicing in Casuarina (Patent # 6825/CHE/2015 – provisional) to farmers for sustainable cropping.
- **Transcriptomics of resistance response in Coffee**: Involved in identifying and developing largest possible number of expressed genes in the two tissues (root and leaf) particularly involved in resistance response. Furthermore, we have developed transcriptomics of resistance response through microarray analysis of Expressed Sequence Tags (ESTs) ***2006***

- **DNA Fingerprinting of Rice and Coffee Germplasm**: I was actively involved in *f*-AFLP based DNA fingerprinting of Indian 'Basmati' rice types as a result of which the elite Basmati variety has been protected under 'IPR protection Act'. I have also been involved in Indian coffee germplasm typing, which involves fingerprinting of large Indian coffee germplasm through various molecular markers, sequencing and analysis. ***2005***

- **Development of markers**: Actively developed various markers systems including genome wise SSRs, EPICs, COSs, SNPs, DArTs in Eucalyptus/Tobacco/Coffee/Casuarina/Corymbia. The validated markers are being used in various breeding pipelines. ***2004+***

- ***Embryology and Tissue Culture***

- **Micropropagation** of Red Sanders (*Pterocarpus santalinus* L.) has been successfully accomplished despite of its difficulties posed by high tannin content. ***1999***
- **Apomixis**: one of the challenging area of research today. I have successfully developed Rice population that presumably has apomictic genes using integrated approaches ***1997***

PATENTS

- **Patent** # 6825/CHE/2015 (provisional) **Method for inducing coppicing in Casuarina**

PROGRAM LEADS

Hold / Holding the lead role in the following programs.

o Tobacco & Eucalyptus camaldulensis genome sequencing (Program Lead)	Life Science and Technology Center, ITC Ltd., IN
o Drone Agriculture (Project Lead)	
o Genomics and Bioinformatics (Domain Lead)	
o Development of adaptable drought tolerant clones in Casuarina (Program Lead)	
o Induction of coppicing clones in Casuarina (Program Lead)	
o Super Hybrids in Corymbia with PY >52% (Program Lead)	
o Supply of high quality seeds through Breeding without breeding in eucalyptus and Casuarina (Program Lead)	

o Coffee Genome Project (Project Lead)	University of Trieste, Italy
o Development and Integration of Physical and Genetic map in Mimulus (Program Lead)	University of North Carolina, USA

SELECTED INVITED LECTURES

- **Genome selection models** – University of North Carolina, USA
- **Insights on CoffeeDNA: A database on Coffee Genomics** – International Centre for Science and High Technology, Trieste, Italy
- **Coffee Genomics** - Department of Biology, University of Trieste, Italy
- **Molecular Phylogenetics: State of art methods for looking into the past** - Centre for Cellular and Molecular Biology, India.

SELECTED PUBLICATIONS

- ***Manuscript in Progress***
  - Anand Kullan, Ashok Kulkarni, Sureshkumar R, and Rajkumar Rathinavleu 2015. Development of microsatellite markers, and their use in genetic diversity and population structure analysis in Casuarina - Tree Genetics & Genomes. – Accepted for publication
  - Anand Kullan and Rajkumar Rathinavelu 2015. Genetic parameter estimation using paternity reconstruction combined with phenotypic preselection in an E. camaldulensis and E. urophylla seed orchard. Tree Genetics & Genomes – under review.
- ***Journals:***
  - R Ragupathy, **R Rathinavelu**, S Cloutier 2011 Physical mapping and BAC-end sequence analysis provide initial insights into the flax (Linum usitatissimum L.) genome ***BMC genomics*** 12 (1), 217
  - PS Hendre, R Kamalakannan, **R Rajkumar**, M Varghese. 2011 High-throughput targeted SNP discovery using Next Generation Sequencing (NGS) in few selected candidate genes in Eucalyptus camaldulensis. ***BMC Genomics*** 5 (Suppl 7), O17
  - K Nagabhushana, PS Hendre, N Sharma, **R Rathinavelu**. 2011 Novel design and deployment of orthologous genic SSR markers in Eucalyptus camaldulensis Dehnh ***BMC Genomics*** 5 (Suppl 7), P51
  - Manoj Kumar Mishra, Patrizia Tornincasa, Barbara De Nardi, Elisa Asquini, René Dreos, Lorenzo Del Terra, Rajkumar Rathinavelu, Paola Rovelli, Alberto Pallavicini, Giorgio Graziosi 2011 Genome organization in coffee as revealed by EST PCRRFLP, SNPs and SSR analysis ***J Crop Sci and Biotech*** 14: 1 25-37
  - Barbara De Nardi, René Dreos, Lorenzo Del Terra, Chiara Martellossi, Elisa Asquini, Patrizia Tornincasa, Debora Gasperini, Beniamina Pacchioni, **Rajkumar Rathinavelu**, Alberto Pallavicini, and Giorgio Graziosi 2006 Differential responses of Coffea arabica L. leaves and roots to chemically induced systemic acquired resistance ***Genome***. 49 1594-1605.
  - A. Baruah, V. Naik, P . S. Hendre, **R**. **Rajkumar**, P. Rajendrakumar and R. K. Aggarwal 2003. Isolation and characterization of nine microsatellite markers from Coffea arabica L., showing wide cross-species amplifications. ***Mol Ecol.***, 3 : 647–650.

- Aggarwal RK., Shenoy VV., Rama Devi J, **Rajkumar** R. and Lalji Singh 2002 Molecular characterization of some Indian Basmati and other elite rice genotypes, using fluorescence-AFLP. ***Theor Appl Genet.***, 105: 680-690.
- Ganeshram, S., P. Vaidyanathan, R. **Rajkumar**, G. Nandakumar and M. Rangaswamy 1998. Species relationship in Oryza and Porteresia through isozyme polymorphism, ***J cytol Genet.***, 33(1):1-5
- **Rajkumar**, R., P. Vaidyanathan, Kapil Deo N. Singh, M. Rangaswamy 1996. Screening of maternal seedlings in rice polyembryony: An approach through isozyme analysis. ***Pure and Applied Science***, 15(1): 47-51

- ***Conference/Abstracts /Book Chapters:***
  - R. **Rajkumar**, B. De Nardi, E. Asquini, P. Tornincasa, C. Martellossi, A. Pallavicini, G. Graziosi. 2004. Molecular markers in coffee (Coffea arabica L.) Int. Con. coffee Science (ASIC) – 2004
  - R.K. Aggarwal, V. Annapurna, A. Ashraf, A. Baruah, P.S. Hendre, V. Naik, R. Phanindranath, N.S. Prakash, P. Rajendrakumar, R. **Rajkumar**, L. Singh, C.S. Srinivasan 2004 Development and Characterization of Coffee Specific Microsatellite Markers for use as Potential Genetic Markers. Int. Con. coffee Science (ASIC) - 2004
  - E. Asquini, NARDI De, TERRA Del, R. Dreos, G. Graziosi, O. Guerreiro-filho, C. Martellossi, A. Pallavicini, R. **Rajkumar**, M.R. Sondhal 2004. Transcriptomics of resistance response in coffee (Coffea arabica L.) Int. Con. coffee Science (ASIC) – 2004
  - R.K. Aggarwal, V. Annapurna, A. Baruah, P.S. Hendre, R. Phanindranath, N.S. Prakash, P. Rajendrakumar, R. **Rajkumar**, A. Santaram, L. Singh, C.S. Srinivasan 2004. Fingerprinting of Indian Coffee Selections and Development of Reference DNA Polymorphism Panels for creating Molecular IDs for Variety Identification. Int. Con. coffee Science (ASIC) – 2004.
  - **Rajkumar** R 2002 Molecular phylogenetics: state of art methods for looking in to the past. 6th-ADNAT on DNA Sequencing and Genotyping, Chaper No. 15: 1 – 28
  - Baruah A, Naik V, Hendre P, **Rajkumar** R, Rajendrakumar P, Asfaq, MA, Prakash NS, Srinivasan CS and RK Aggarwal 2002 Development and characterisation of microsatellite markers in Coffea arabica (L.) for their use as potential genetic markers 6th-ADNAT on Functional Genomics, 23.
  - **Rajkumar** R, A. Santaram, C. S. Srinivasan and R. K. Aggarwal 2000. An appraisal of Random Amplified Polymorphic DNA markers with reference to intra-population variation in Coffea species. PLACROSYM, 112
  - Saini N., R. **Rajkumar**, A. Santaram, C. S. Srinivasan and R. K. Aggarwal 2000. Understanding Generic Affinities among some of the Coffea species and related taxa using ISSR and RAPD markers. PLACROSYM, 113
  - Shanmugasundaram. P., A. Selvi, S. Mohan kumar, Kapil Deo N. Singh, J. Souframanien, T. Thirumurugan, T. Parimelazhagan, R. **Rajkumar**, P. Nagarajan and S. Sadasivam 1999. Molecular tagging of genes for yellow stem borer resistance in rice. International Rice Biotechnology Network, Pucket, Sep. 1999. 262.
  - **Rajkumar**, R., P. Vaidyanathan, Kapil Deo N. Singh, M. Rangaswamy and S. Ganeshram. 1998. A new protocol for in vitro scanning of anomalous embryosac in rice. I National Plant breeding Congress, 53
  - **Rajkumar**, R., P. Vaidyanathan, Kapil Deo N. Singh, M. Rangaswamy 1998. A novel approach to identify apomixis in rice. I National Plant breeding Congress, 202

- Ganeshram G, R. **Rajkumar**, M. Pandian and P. Gomathinayagam 1998. Identification of Vigna species and phylogenetic relationship as revealed by SDS-PAGE on seed proteins I National Plant breeding Congress, 173
- Gomathinayagam P., G. Ganeshram, M. Pandian and R. **Rajkumar** 1998. Study on barriers to inter-specific hybridization between Vigna angiculata L. Walp and V. vexillata L. A. Rich I National Plant breeding Congress, 169
- **Rajkumar**, R., P. Vaidyanathan, Kapil Deo N. Singh, M. Rangaswamy 1996. Investigation on the occurrence on twin seedlings in rice. National Symposium on Rice Biotechnology, 8

REFERENCES

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