

C.K. Madhubalaji
Research Scientist (Food disinfection)
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Professional Summary

Experienced professional in the area of Biochemical Engineering and Biotechnology. Possess International research experience with strong track record of working cross functionally in teams. Determined to utilize my research and engineering experience in the area of Biotechnology, bioactive metabolite identification and characterization, food crop (grains and spices) protection/disinfection using advanced oxidation processes, trouble shooting in bioreactors, upstream and downstream processing.

Technical Skills

- Experience in handling and maintenance of bacteria, yeast, microalgae, fungal cell cultures
- Expertise in the troubleshooting of the various bioreactors (CSTR, Flat panel PBR, Airlift PBR)
- Expertise in handling modern analytical instruments viz. Gas chromatograph, confocal and fluorescence microscopy, Nuclear Magnetic Resonance (NMR) integrated with Topspin (Bruker), Gas Chromatography Mass spectrophotometer (GC-MS), High pressure Liquid Chromatography (HPLC), Fourier transform infrared (FTIR), Scanning Electron Microscopy, bioreactors, Flow cytometer (CYTO FLEX), ELISA reader, PCR, 96 well plate reader and UV-Visible spectrophotometer
- Bioprospecting of microalgae for high value products
- Experience in bacterial and algal fermentations for the production of valuable metabolites
- Experience in downstream processing of valuable bioactive from microbial cultures
- Experience in animal (rat, mice and rabbit) handling intubation, maintenance, dissection, histopathology, and haematology
- Experience in gene cloning, transformation, and expression studies
- Experience in biochemical qualitative and quantitative experiments and enzyme kinetics studies
- Experience in isolation, identification and characterization of various microbial culture
- Experience in scientific and grant writing skills
- DNA, RNA, and protein extraction, agarose and polyacrylamide gel electrophoresis, protein purification techniques.
- Familiar with modelling software Superpro Designer, Life cycle assessment, MATLAB Software and bioreactor designing tools
- Metagenome analysis, OTU Picking, taxonomy assignment, α , and β diversity analysis, statistical analysis including PCoA, clustering analysis, production of error-free 16S genome sequencing.
- Experience using software like CLC Genomics Tool, PICRUST, BioEdit, Rasmol, Pymol.

Professional Experience

Aug 2021- till date: **Research Scientist**, Ozone Research Applications India, Pvt. Ltd. Nagpur, India.

Aug 2017-Aug 2021: **Senior Research Fellow**, CSIR-Central Food Technological Research Institute, Mysuru, India.

Nov 2015-Aug 2017: **Junior Research Fellow**, CSIR-Central Food Technological Research Institute, Mysuru, India

Educational Qualifications

2021, Doctor of Philosophy (**PhD**) from Academy of Scientific and Innovative Research, CSIR-Central Food Technological Research Institute, Mysuru, India.

Thesis: Studies on microalgae-bacterial association for biomass production, metabolites and their bioavailability
2015, Masters of Technology (**M.Tech**) in Biochemical engineering, Jawaharlal Nehru Technological University, Hyderabad, India

2013, Bachelor of Technology (**B.Tech**) in Biotechnology, Jawaharlal Nehru Technological University College of Engineering, Pulivendula, India

Professional Training

- Completed “In house animal Training for handling, experimental planning and ethical approvals” at CSIR-CFTRI, Mysuru.
- Completed “Post Graduation Diploma in Business Management” (PGDBM) from Osmania University, Hyderabad, 2016

- Completed "Microalgae cultivation for biodiesel production and wastewater remediation: Nutritional mode and process optimization studies" at CSIR- Indian Institute of Chemical Technology, Tarnaka, Hyderabad.
- Completed "Cloning & Expression of laccase gene are isolated from *Aspergillus nidulans* in *E. coli*" at Global Institute of Biotechnology, Hyderabad.
- Completed a project entitled "Extraction, Transformation, purification, & Immune detection of the protein Glutathione S-Transferase from different strains of *E. coli*" at Geno helix Institute in Bangalore.
- Completed "Structural and functional characterization of *Vigna Sp.*" using bioinformatics tools at Muvva Bio-solutions in Hyderabad.

Awards/achievements

- Selected for Newton Bhabha PhD Placement program, by British Council, UK and Department of Biotechnology, India. Placed at Queens University Belfast, NI, UK for the year of 2020-2021 in the field of "Food, Energy and Water Nexus"
- Received **Young Researcher Award** for the year 2021 from Institute of Scholars
- Awarded CSIR-Senior Research Fellowship in the field of "Engineering Sciences" to conduct work at CSIR-CFTRI
- *GATE-2013 (Biotechnology): Percentile: 92.17, All India Rank: 1265.*
- *GATE-2017(Biotechnology) Percentile: 96.08, All India Rank :302*
- Won First prize in Vignan Mahotsav for poster presentation at Vignan University, Guntur.
- Participated in National Level Science Fair conducted at Dharmavaram during school age
- First rank holder of Kadiri town (Anantapur District, AP, India) during the intermediate level
- Got the prize in Mandal level Mathematics Talent test at school level
- First prize in "Banner-making competition – 2010" at JNTU CEP.
- Several prizes received for the Essay competitions, elocutions at school & college-level programs
- Participated in Gunnies world records official attempt on largest YOGA Lesson- single venue on International yoga day at Mysore

Work experience

As a **Research Scientist** Development of advanced systems for food grains, flours and spices disinfection from bacterial, fungal and insects as well as for toxin removal

- **Insect and fungal control of Wheat, peanut, and maize through advanced oxidation processes.** Quality control and detailed proximate composition analysis of the food grains using high-end instrumentation.
- Ozone-based system (with non-thermal, chemical-residue-free, low-cost and energy efficient) development and its scientific efficacy, safety validation in accordance with regulation of FSSAI for removal of toxins from food (wheat, corn and peanut).

As a **Visiting Research Scholar** at Queens University Belfast, I have worked on

- Extraction, purification and characterization of natural food grade pigment named 'phycocyanin' from *Spirulina* biomass using hydrodynamic cavitation technology.
- *Chlorella* biomass pretreatment with hydrodynamic cavitation for improvement of nutrients accessibility and their digestibility evaluated through *In vitro* digestion process.
- Hydrodynamic cavitation treated residual microalgal biomass used in the anaerobic digestion to produce biomethane.
- Microalgal biomass associated bacterial diversity during the anaerobic digestion was evaluated through 16s rDNA metagenome analysis

As a **Senior Research Fellow**, at CSIR-CFTRI, Mysuru, I have worked on

- at different growth conditions (light intensity, photoperiod, flowrate, and CO₂) effect on various metabolites were evaluated in an airlift photobioreactor.
- Various microalgae associated bacterial abundance, diversity and functional predictions were evaluated through high throughput sequencing metagenome analysis.
- Microalgae bacterial association studies were conducted in various cultivation systems such as open raceway pond, airlift photobioreactor, lab-scale flask.
- Evaluated ozonation technology as one of the best possible solutions for challenges faced during the downstream processing of the removal of bacteria from algae without affecting the algae.

- In animal models, *Spirulina* and *Chlorella* biomass were fed to Wistar rats and their effect on the gut microbiota especially fecal and cecum microbiota were assessed through 16srDNA metagenome analysis.
- In Clinical studies, *Spirulina* biomass supplementation to malnutrition children for their micronutrient status amelioration were conducted at KR Hospital, Mysuru.

As a **Junior Research Fellow**, for a project entitled "Microalgae as an alternative source for bioavailable vitamin B₁₂" at CSIR-Central Food Technological Research Institute (CFTRI), Mysore, *key responsibilities* are

- Microalgae maintenance, cultivation from lab scale to pilot scale open raceway pond (5000L)
- Trouble shooting of the various bioreactors airlift photo-bioreactor, flat panel photobioreactor, bubble column and continuous stirred tank reactors
- Microalgal growth and their metabolites (lipids, protein, carbohydrates) productivity optimization in APBR, CSTR, FPBR systems
- Vitamin B₁₂ extraction, purification (solid phase extraction, XAD column, immuno-affinity column) procedures.
- Optimization of vitamin B₁₂ quantification methods (HPLC, Microbiological assay)
- Effect of drying methods on algal biomass
- Evaluated the bioavailability of vitamin B₁₂ from microalgal biomass namely *Chlorella* and *Spirulina* in animal models through circulatory and functional markers.

Publication record

Number of Research articles: 8

Number of Book chapters: 8

Number of International conferences attended: 4

List of Scientific Publications

1. **Madhubalaji CK**, Rashmi V, Chauhan VS, Dharmesh SM, Sarada R.(2019) Improvement of vitamin B₁₂ status with *Spirulina* supplementation in Wistar rats validated through functional and circulatory markers. *J Food Biochem*. 2019;00:e13038. <https://doi.org/10.1111/jfbc.13038> (**Impact factor: 2.72**)
2. **Madhubalaji, C. K.**, Sarat T Chandra, V. S. Chauhan, R. Sarada, and Sandeep N. Mudliar. "*Chlorella vulgaris* cultivation in airlift photobioreactor with transparent draft tube: effect of hydrodynamics, light and carbon dioxide on biochemical profile particularly ω -6/ ω -3 fatty acid ratio." *Journal of Food Science and Technology* 57, no. 3 (2020): 866-876. (**Impact factor: 2.701**)
3. **Madhubalaji C.K.**, Shabazuddin M, Sreevathsan S, Sarada R, Sandeep N Mudliar (2020) "Ozonation as non-thermal option for bacterial load reduction of *Chlorella* biomass cultivated in airlift photobioreactor" *Journal of Cleaner Production*. 276, 123029. June 2020 (**Impact factor: 9.27**)
4. **Madhubalaji, C.K.**, Rashmi, V., Chauhan, V.S. and Sarada R. Improvement in vitamin B₁₂ status of **Wistar rats** by supplementing the diet with *Chlorella vulgaris* biomass. *J Food Sci Technol* (2020). <https://doi.org/10.1007/s13197-020-04901-9> (**Impact factor: 2.701**)
5. **Madhubalaji, C. K.**, Sandeep N. Mudaliar, Vikas Singh Chauhan, and R. Sarada. "Evaluation of drying methods on nutritional constituents and antioxidant activities of *Chlorella vulgaris* cultivated in an outdoor open raceway pond." *Journal of Applied Phycology* 33, no. 3 (2021): 1419-1434. (**Impact factor: 3.217**)
6. Neenu, Ravikumar, **Chegukrishnamurthi Madhubalaji**, Venkatasubbaiah Rashmi, Vikas Singh Chauhan, Shylaja M. Dharmesh, and Ravi Sarada. "Prevention and amelioration of erythrocyte instability observed under deficiency of vitamin B₁₂ alone or combined with micronutrient limitation through dietary supplementation with *Chlorella* and *Spirulina*." *Indian Journal of Experimental Biology (IJEB)* 60, no. 01 (2021): 7-16. (**Impact factor: 0.8**)
7. **Chegukrishnamurthi, Madhubalaji**, Ajam Shekh, Sarada Ravi, and Sandeep Narayana Mudliar. "Volatile organic compounds involved in the communication of microalgae-bacterial association extracted through Headspace-Solid phase microextraction and confirmed using gas chromatography-mass spectrophotometry." *Bioresource Technology* 348 (2022): 126775. (**Impact factor: 9.6**)
8. **Madhubalaji, Chegu Krishnamurthi**, Sarada Ravi, and Sandeep N. Mudliar. "Unraveling of *Chlorella*-associated bacterial load, diversity, and their imputed functions at high-and low-yield conditions through metagenome sequencing." *Journal of Phycology* (2022). (**Impact factor: 2.92**)
9. Sandopu Sravan Kumar, Vallamkondu Manasa, Chegu Krishnamurthi Madhubalaji, Parvatam Giridhar "Comparison of GC/MS fatty acid profiles and biodiesel characteristics of five selected green leafy vegetable foliage" (Under communication)
10. **Madhubalaji C.K.**, Sarada R, Sandeep N Mudliar "Evaluation of fecal and cecal bacterial diversity using 16s rDNA metagenome analysis in microalgal biomass supplemented Wistar rats" (With Journal)

11. **Madhubalaji C.K.**, Sarada R, Sandeep N Mudliar "In sites into the Bacterial diversity associated with four industrially potential microalgae" (Under communication)
12. **Madhubalaji C.K.**, Sarada R, Sandeep N Mudliar "Photo-chemistry influenced by the *Rhizobium* supplements to the *Chlorella* and *Spirulina* studied under various nutritional modes" (Under communication)
13. **Madhubalaji C.K.**, Sanjay Nagarajan, Sarada R, Sandeep N Mudliar, Vivek Ranade "Improved bio accessibility and digestibility of the *Chlorella* biomass nutrients through hydrodynamic cavitation". (Under communication).

Book chapters

1. **Madhubalaji C.K.**, Ajam Shekh, Sijil, P.V., Sandeep Mudliar, Vikas Singh Chauhan, R. Sarada, Ranga Rao A, and Ravishankar G.A., (2019) Open Cultivation System and Closed Photobioreactors for Microalgal Cultivation and Biomass Production. In: Handbook of Algal Technologies and Phytochemicals: Volume-II Phycoremediation, Biofuels, and Global Biomass Production Edited by G.A. Ravishankar and A. Ranga Rao, Volume-II, CRC Press, USA. ISBN No: 978-0-367-17819-2.
2. Swarnalatha G.V, Ajam Shekh, Sijil P.V, **Madhubalaji C.K.**, Vikas Singh Chauhan, R. Sarada (2019). Carbon Dioxide Sequestration by Microalgae. In: Handbook of Algal Technologies and Phytochemicals: Volume-II Phycoremediation, Biofuels, and Global Biomass Production Edited by G.A. Ravishankar and A. Ranga Rao, Volume-II, CRC Press, USA. ISBN No: 978-0-367-17819-2.
3. **Madhubalaji CK**, Ajana P, Vikas Singh Chauhan, R.Sarada (2019) Microalgal Secondary metabolites. In: Applied Algal Biotechnology, Edited by Muthu Arumugam, S Kathiresan, S. Nagaraj. Nova Science Publishers, USA. ISBN No:978-1-53617-524-0 p; 69-104.
4. Sarat Chandra T, **Madhu Balaji CK**, Ramesh Babu P (2021). Microalgae as an alternative sustainable source of squalene. In Microalgal Biotechnology- Recent advances, Market potential, and Sustainability. Edited by Sarada R, Azam sheik, Royal Society of Chemistry. ISBN No. 978-1-83916-003-5, eISBN No. 978-1-83916-351-7.
5. **Chegu Krishnamurthi Madhubalaji**, G. Venkata Swarnalatha, Senthilkumar Rajagopal. (2020). Microalgae and Its Diversity for Global Sustainability. In: Subhash J.Bhore and K.Marimuthu. (Eds). Biodiversity for Sustainability – Challenges and Perspectives in the Post-Pandemic Era. AIMST University Publishers, Malaysia.
6. Sarat Chandra T, **Madhu Balaji CK**, Ramesh Babu P (2021). Emerging Contaminants of Potential Concern in Aquatic Eco-system: Fate and Transport in Microalgae. In: Legacy, Pathogenic, and emerging contaminants in the Environments, CRC Press, USA. ISBN: 978-0-367-74363-5 (Hbk) ISBN: 978-0-367-74365-9 (Pbk), ISBN: 978-1-003-15746-5 (eBook)
7. Neenu Ravikumar, **Madhubalaji Chegukrishnamurthi**, Swarnalatha G.V (2021). Role of Micronutrients in Neurological development. In: "*Role of Nutrients on Neurological Disorders*" edited by Senthilkumar Rajagopal, Saravanan, Swarnalatha, and Geethalakshmi. Springer Nature Publications, Germany. Book series title: Nutritional Neuroscience. Series Editor - Mohammed Essa. 2020. ISSN: 2730-6712.
8. **C. K. Madhubalaji**, Neenu Ravikumar, G.V.Swarnalatha, E.C.Surendranatha Reddy (2021). Algae as a potential vegetative source of PUFA for the prevention of neurological disorders. In: "*Role of Nutrients on Neurological Disorders*" edited by Senthilkumar Rajagopal, Saravanan, Swarnalatha, and Geethalakshmi. Springer Nature Publications, Germany. Book series title: Nutritional Neuroscience. Series Editor - Mohammed Essa. 2020. ISSN: 2730-6712.
9. Supta Sarkar, **Madhubalaji Chegu Krishnamurthi** (2021). Nutritional, dietary and lifestyle approaches for prevention and management of Alzheimer's disease. In: 'Impact of micronutrients on Obsessive Compulsive Disorder (OCD)' edited by Senthilkumar Rajagopal, Saravanan, Swarnalatha, and Geethalakshmi. Springer Nature Publications, Germany. Book series title: Nutritional Neuroscience. Series Editor - Mohammed Essa. 2020. ISSN: 2730-6712.

Patents

A strategical and advanced method for fungus and their produced Aflatoxin degradation/decontamination in selected grain. Patent application needs to be submitted.

References

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