

Curriculum Vitae

Arjun Tiwari MSc, PhD

Adjunct Professor

Molecular Plant Biology Unit,

Department of Life Technologies

University of Turku

Turku, Finland

E-Mail: arjun.tiwari@utu.fi

Orcid Id 0000-0001-9095-2061

Phone: +358 449 890 915

Research Topics

Plant stress, Bioenergetics, Photosynthetic regulations, carbon assimilation process, gaseous exchange in plants, molecular biophysics and biochemistry, formation of reactive oxygen species and their signaling in plants, redox biochemistry, Bioenergy and Biomass production.

Education

- 2008** **Ph.D. in Life Sciences** from Photosynthesis Laboratory, School of Life Science, Devi Ahilya University, Indore, India.
- 2001** **M.Sc. in Life Sciences** from School of Life Sciences, Devi Ahilya University, Indore, India.
- 1999** **B.Sc. in Botany, Zoology, Chemistry**, from P.M.B. Gujrati Science College, Devi Ahilya University, Indore, India

Current Position

- 2020 – Cont.** **Adjunct Professor** at Molecular Plant Biology, Department of Life Technologies, University of Turku, FI-20014 Turku, Finland

Employment History

- 2013 – 2020** **Junior/Senior Researcher, Post doctorate fellow** at Molecular Plant Biology, Department of Life Technologies, University of Turku, FI-20014 Turku, Finland
- 2012** **Post doctorate fellow** at Laboratory of Biophysics, Department of Experimental Physics, Palacky University, Olomouc, Czech Republic

- 2009-2011** **Senior Scientist** – Bionutrition and Metabolomics Division, Avesthagen Limited, Bangalore, India
- 2007-2009** **Post doctorate fellow** at Laboratory of Biophysics, Department of Experimental Physics, Palacky University, Olomouc, Czech Republic
- 2002-2007** **PhD, Project Associate**, in University Grants Commission (UGC) project of Dr. Anjana Jajoo, School of Life Sciences, Devi Ahilya University, Indore, India.
- 2001** **Trainee**, Bio-medical Application Section, Centre for Advanced Technology, Indore, India (Jan 2001 to Dec 2001).

Honors and Awards

Adjunct Professor, Biochemistry and biophysics of plants (2020) University of Turku, Turku, Finland

Young Talent award (2016) “International conference Photosynthesis Research for Sustainability” held in Pushchino, Russia June 19th–25th 2016

Project grant (P501/10/364) from 2010 to 2012 by Grantove Agentura Ceska Republica (GACR), Czech Republic entitled “Characterization of native PSII-LHCII supercomplexes in thylakoid membranes - proteomic approach to study their disassembly at heat stress”. *Not Aailed

Lectureship Eligibility Award by Council of Science and Industrial Research-University Grants Commission, India (CSIR-UGC), National eligibility test examination (cleared twice June 2001, December 2002).

Senior Research Fellowship awarded by CSIR, India (March 2005)

Research Supervision

Phd Supervision 1. Completed – one as co-supervisor (PhD awarded)
2. Ongoing – one as co-supervisor

Master Supervision several master students trained and supervised

Teaching Experience

1. Teaching in Biophysics PhD course work at university of Turku.
2. Experimental training to master level students at Devi Ahilya University, Indore and Palacky University, Czech Republic.

Research Areas Position-wise

Current **Jan 2020 to current** – Study of light effects on growth and biomass fixation in Lettuce and other vegetable plants. Analysis of gas fluxes in a chamber with an aim to optimize the minimum energy expenditure to attain maximum continuous growth. Understanding role of light intensities for switching photosynthetic electron transfer process to reactive oxygen species generation and photorespiration. Use of Jupyter Notebook and R for online live data analysis and maintenance.

Jan-2013 to Dec 2019 – Plant Molecular Biology Unit, Department of biochemistry and Food Chemistry, University of Turku, Finland

Presently, working on the regulation of photosynthesis process under fluctuating light conditions in lettuce and Arabidopsis mutant plants. Mainly, I am studying the process during photosynthesis also involving regulatory role of photosystem I and stromal redox state to protect photosynthetic apparatus during environmental fluctuations and light conditions which lowers biomass accumulation in plants and lower organisms.

Post-doctorate **Jan-2012 to Dec-2012** – Department of Biophysics, Palacky University, Olomouc, Czech Republic.

Biophysical characterization study of redox biochemistry of site of reactive oxygen species generation in photosystem II by EPR spin trapping; and involvement of superoxide in generating carbon centered radical and further oxidative damage to lipids and polypeptides of photosystem II complex.

Industrial Experience **Dec-2009 to Aug-2011** – As a **Senior Scientist** in Bionutrition and Metabolomics Group, Science and Innovation Division, Avesthagen Limited, Bangalore-560066, India.

Metabolic profiling of 71 colored rice varieties using mass spectroscopy. Functional characterization of identified antioxidants and health promoting components. For the same, I did formulate quality data analysis pipeline for mass spectrometry data (LCMS). This was suitably applied to a variety of plants and human samples. Further, using this kind of analysis pipeline, a large number of different plant species sample's analysis (>15 different plants) was done.

Post-doctorate **Aug-2007 to Dec-2009** – Department of Biophysics, Palacky University, Olomouc, Czech Republic.

i) The work involved studies and characterization of protein complexes associated to PSII supercomplexes and their decomposition at high temperature. Using proteomic methods like silver staining, western blotting, studies of these protein subunits by using Mass spectroscopy.

ii) The work involved in-depth studies of structure, function and redox states of cytochrome b₅₅₉ in photosystem II and process of activation of oxygen into reactive oxygen species by various reactions using biophysical approaches like redox titration; time resolved

spectroscopy, EPR spin trapping as well as chemical modifications of amino acid residue of polypeptides.

PhD **Mar-2002 to Aug-2007** – Photosynthesis Lab, School of Life Sciences, Devi Ahilya University, Indore, India.

The work involved molecular characterization of all heat susceptible sites in photosynthetic apparatus using intensive biochemical and biophysical methods like EPR spin trapping, Fluorescence spectroscopy at room temperature and low temperature, Low temperature EPR spectrometry of tyrosine and PSI, Fluorescence kinetics and polarization, membrane fluidity and metalloproteins etc.

Pre-PhD **Jan-2001 to Dec-2001** – Bio-medical Application Section, Raja Ramanna Centre for Advanced Technology, Indore, India.

This work involved chemical modification of photosensitive pigments into a chlorine derivative photosensitizer. In vivo and in vitro application and photodynamic effects of these chemically synthesized photosensitizers on model systems fibrosarcoma bearing mice, hamsters and breast carcinoma cells, respectively.

List of publications

a. Peer reviewed research Articles (corresponding author)*

1. Tiwari A*, Tikkanen M., Aro EM., (2023) Striking the balance: protecting photosystem I at the expense of photosystem II. *Submission ready*
2. Tiwari A*, Mamedov F., Fitzpatrick D., Gunell S., Tikkanen M., Aro EM., (2023) Balancing Act: the crucial role of FeS cluster photodamage in regulating excess electron flow through photosystem I. *Under Revision*
3. Tiwari A*, Aro EM. (2022) Paradoxes in judging the inhibition of photosynthetic electron transfer chain using P700 oxidation and dark re-reduction analyses. *BBA-Bioenergetics* 1863 (7), 148581-148581.
4. Fitzpatrick D., Aro EM., Tiwari A*. (2022) True oxygen reduction capacity during photosynthetic electron transfer in thylakoids and intact leaves. *Plant Physiology* 189 (1), 112-128
5. Barajas-Lopez JD., Tiwari A., Zarza X., Shaw MW., Pascual J., Punkkinen M., Bakowska JC., Munnik T., Fujii H. (2020) EARLY RESPONSE TO DEHYDRATION 7 Remodels Cell Membrane Lipid Composition During Cold Stress in Arabidopsis. *Plant Cell Physiol.* <https://doi.org/10.1093/pcp/pcaa139>
6. Shapiguzov A, Nikkanen L, Fitzpatrick D, Vainonen JP et al. (2020) Dissecting the interaction of photosynthetic electron transfer with mitochondrial signalling and hypoxic response in the Arabidopsis rcd1 mutant. *Phil. Trans. R. Soc. B* 375 (11801), 20190413

7. Fitzpatrick D., Aro EM., Tiwari A*. (2020) Re-examining the efficacy of DNP-INT to inhibit reduction of photosystem I in thylakoid and leaf disc samples. *Frontiers in plant sciences* 11, 382
8. Rantala S., Lampioinen T., Gerotto C., Tiwari A., Aro EM., Tikkanen M. (2020). (2020) PGR5 and NDH-1 do not function as protective electron acceptors but mitigate the consequences of PSI photoinhibition. *Biochim. Biophys. Acta – Bioenergetics* 1861(3) 148154
9. Nikkanen L., Guinea Diaz M., Toivola J., Tiwari A., Rintamäki E. (2019) Multilevel regulation of non-photochemical quenching and state transitions by chloroplast NADPH-dependent thioredoxin reductase. *Physiol Plant* <https://doi.org/10.1111/ppl.12914>
10. Shapiguzov A., Vainonen J., Hunter K., Tossavoinen H., Tiwari A., et al. (2019) RCD1 Coordinates Chloroplastic and Mitochondrial Electron Transfer through Interaction with ANAC Transcription Factors. *eLife* 8, e43284 (bioRxiv 327411; doi: <https://doi.org/10.1101/327411>)
11. Gollan P., Lima-Melo Y., Tiwari A., Tikkanen M. and Aro EM (2017) Interaction between photosynthetic electron transport and chloroplast sinks regulates metabolism and signaling important for productivity. *Phil. Trans. R. Soc. B* 372 (1730), 20160390
12. Vuorijoki L., Tiwari A., Kallio P. and Aro EM (2017) Inactivation of iron-sulfur cluster biogenesis regulator SufR in *Synechocystis* sp. PCC 6803 induces unique iron-dependent protein-level responses. *BBA-Gen Sub* 1861 (5), 1085-1098
13. Tiwari A., Mamedov F., Grieco M., Suorsa M., Jajoo A., Styring s., Tikkanen M., and Aro EM. (2016) Photodamage of iron–sulphur clusters in photosystem I induces non-photochemical energy dissipation. *Nature Plants* 2: 16035-16043
14. Jajoo A., Mekala NR., Tongra T., Tiwari A., Grieco M., Tikkanen M. and Aro EM.(2014) Low pH-induced regulation of excitation energy between the two photosystems. *FEBS Letters* 588 (6): 970-974
15. Tiwari A., Rac M. and Pospisil P. (2013) Formation of superoxide anion and carbon-centered radicals by photosystem II studied by EPR spin-trapping technique - relevance to plant oxidative stress. *J. Bioenerg. Biomembr.* 45(6): 551-559
16. Pospisil P. and Tiwari A. (2010) Differential mechanism of light-induced and oxygen-dependent restoration of the high-potential form of cytochrome *b₅₅₉* in Tris-treated photosystem II membranes. *Biochim. Biophys. Acta -Bioenergetics*, 1797: 451-456
17. Sinha R., Tiwari A. and Pospisil P. (2010) Water-splitting manganese complex controls light-induced redox changes of cytochrome *b₅₅₉* in Photosystem II. *J. Bioenerg. Biomembr.* 42(4): 337-344

18. Tiwari A. and Pospisil P. (2009) Superoxide oxidase and reductase activity of cytochrome *b*₅₅₉ in photosystem II. *Biochim. Biophys. Acta*, 1787: 985-994
19. Tiwari A., Jajoo A. and Bharti S. (2008) Heat-induced changes in photosystem I activity as measured with different electron donors in isolated spinach thylakoid membranes. *Photoch Photobio Sci.*, 7: 485-491
20. Tiwari A., Jajoo A. and Bharti S. (2008) Heat-induced changes in the EPR signal of tyrosine D (Y_D^{OX}): a possible role of Cytochrome b559. *J Bioenerg. Biomem.*, 40: 237-243
21. Tiwari A., Jajoo A., Bharti S. and Mohanty P. (2007) Differential response of chloride binding sites to elevated temperature: A comparative study in spinach thylakoids and PSII-enriched membranes. *Photosynth. Res.* 93, 123-132
22. Guruprasad K., Bhattacharjee S., Kataria S., Yadav S., Tiwari A., Baroniya S., Rajiv A. and Mohanty P. (2007) Growth enhancement of soybean (*Glycine max*) upon exclusion of UV-B and UV-B/A components of solar radiation: characterization of photosynthetic parameters in leaves. *Photosynth. Res.* 94:299-306
23. Dutta A., Dube A., Jain B., Tiwari A. and Gupta P.K. (2002) The Effect of pH and Surfactant on the Aggregation Behavior of Chlorin *p*₆: A Fluorescence Spectroscopic Study. *Photochem. Photobiol.* 75, 488-494

b. Full Length Articles In Conference Proceedings

1. Tiwari A., Dube A. and Gupta P.K. (2001) Photodynamic Inactivation of Human Breast Carcinoma Cells (MCF-7) by using Chlorin *p*₆, a photosensitizer prepared From Chlorophyll-a. In: Proce. DAE-BRNS Nat. Las. Sympo. 373-374 [ISBN 81-7764-229-4](#)
2. A. Dube, M. Sharma, A. Tiwari and P.K. Gupta (2001) Invivo fluorescence studies on the accumulation of various photosensitizers in fibrosarcoma bearing mice. In: Proceedings of the DAE-BRNS Nat. Las. Sympos. 371-372. [ISBN 81-7764-229-4](#)
3. Datta A., Dube A., Jain B., Tiwari A. and Gupta P.K. (2001) The effect of pH on aggregation behavior of chlorin *p*₆: a fluorescence spectroscopic study. In: Proceedings of the DAE-BRNS Nat. Las. Sympos. 357-358 [ISBN 81-7764-229-4](#)

c. Book Edited

1. Temperature stress-induced impairments in photosynthetic apparatus (Editor A. Tiwari), Lap Lambert Academic Publishing, GmbH & Co., Germany ISBN 978-3-659-93907-5

*d. Conference Presentations *Oral/Poster; §International*

1. §* A. Tiwari (2017) 8th International conference on photosynthesis and Hydrogen Energy Research for Sustainability, 30 Oct - 4th Nov 2017, University of Hyderabad, Hyderabad, India
2. §* A. Tiwari International conference Photosynthesis Research for Sustainability” 2016 June 19th–25th held in Pushchino, Russia
3. A. Tiwari, F. Mamedov, M. Tikkanen and E-M. Aro (2014) Physiological relevance and underlying molecular mechanism of photosystem I photodamage in *pgr5* mutant. Nordic Photosynthesis conference 2014, Uppsala, Sweden
4. §*A. Tiwari and P. Pospisil (2008) Superoxide oxidase and reductase activity of cytochrome *b₅₅₉* in photosystem II. In: Photosynthesis in global perspective Nov 27th-29th, in Indore, India.
5. §A. Tiwari, A. Jajoo and S. Bharti (2006) Low affinity site of Cl⁻ within the oxygen evolving complex is not the primary target of high temperature. In: PS-MEETING 2006, August 20th-27th in Pushchino, Moscow region, Russia.
6. §A. Tiwari, A. Jajoo and S. Bharti (2006) Temperature dependent fast decay of EPR signal II_{slow} (Y_D⁺) in dark. In: PS-MEETING 2006, August 20th-27th, in Pushchino, Moscow region, Russia.
7. §*A. Tiwari, K.N. Guruprasad, S.K. Bhattacharjee, S. Kataria, S. Yadav, S. Singh, A. Rajeev and P. Mohanty (2006) Effects of exclusion of UV-B and UV-B/A components of solar radiation on growth and photosynthesis in Soybean. In: Indo-Russian Long Term Project (ILTP) Meeting, 19th Aug, Pushchino, Russia.

e. Other Scientific Publications

1. Master thesis: Arjun Tiwari (2001) Photodynamic effects of *chlorin-p6* and *purpurin-18*, photosensitizers prepared from Chlorophyll-*a* on human breast carcinoma cells MCF-7 and fibrosarcoma bearing mice, School of Life Science, Devi Ahilya University, Indore, India
2. PhD thesis: Arjun Tiwari (2008) Characterization of temperature-induced impairments in photosynthetic apparatus, School of Life Science, Devi Ahilya University, Indore, India