

Taina Tyystjärvi

List of publications 10.2.2022

Turunen O, Koskinen S, Kurkela J, Karhuvaara O, Hakkila K, Tyystjärvi T. (2022) Roles of close homologues SigB and SigD in heat and high light acclimation of the cyanobacterium *Synechocystis* sp. PCC 6803. **Life 12: 162**

Linhartová M, Skotnicová, Hakkila K, Tichý M, Komenda J, Knoppová J, Gilabert JF, Guallar V, **Tyystjärvi T**, Sobotka R (2021) Mutations suppressing the lack of prepilin peptidase provide insights into the maturation of the major pilin protein in cyanobacteria. **Frontiers in Microbiology 12: 756912.**

Kurkela J, Fredman J, Salminen TA, **Tyystjärvi T** (2021) Revealing secrets of the enigmatic omega subunit of bacterial RNA polymerase. **Molecular Microbiology 115: 1-11.**

Mattila H, Khorobrykh S, Hakala-Yatkin M, Havurinne V, Kuusisto I, Antal T, **Tyystjärvi T**, Tyystjärvi E (2020) Action spectrum of the redox state of the plastoquinone pool defines its function in plant acclimation. **Plant Journal 104: 1088-1104.**

Antal T, Petrova E, Slepnyova V, Kukarskikh G, Volgusheva A, Dubini A, Baizhumanov A, **Tyystjärvi T**, Gorelova O, Baulina O, Chivkunova O, Solovchenko A, Rubin AB (2020) Photosynthetic hydrogen production as acclimation mechanism in nutrient-deprived *Chlamydomonas*. **Algal Research 49:101951.**

Valev D, Kurkela J, Tyystjärvi E, **Tyystjärvi T** (2020) Testing the potential of regulatory sigma factor mutants for wastewater purification or bioreactor run in high light. **Current Microbiology 77: 1590-1599.**

Khorobrykh S, Tsurumaki T, Tanaka K, **Tyystjärvi T**, Tyystjärvi E (2020) Measurement of the redox state of the plastoquinone pool in cyanobacteria. **FEBS Letters 594: 367-375.**

Hakkila K, Valev D, Antal T, Tyystjärvi E, **Tyystjärvi T** (2019) Group 2 sigma factors are central regulators of oxidative stress acclimation in cyanobacteria. **Plant and Cell Physiology 60: 436-447.**

Koskinen S, Hakkila K, Kurkela J, Tyystjärvi E, **Tyystjärvi T** (2018) Inactivation of group 2 σ factors upregulates production of transcription and translation machineries in the cyanobacterium *Synechocystis* sp. PCC 6803. **Scientific Reports 8:10305.**

Stensjö K, Vavitsas K, **Tyystjärvi T** (2018) Harnessing transcription for bioproduction in cyanobacteria. **Physiologia Plantarum, 162: 148-155.**

Heilmann B, Hakkila K, Georg J, **Tyystjärvi T**, Hess WR, Axmann IM, Dienst D (2017) 6S RNA plays a role in recovery from nitrogen depletion in *Synechocystis* sp. PCC 6803. **BMC Microbiology 17: 229.**

Kurkela J, Hakkila K, Antal T, **Tyystjärvi T** (2017) Acclimation to high CO₂ requires the ω subunit of the RNA polymerase in *Synechocystis*. **Plant Physiology 174: 172-184.**

Antal T, Kurkela J, Parikainen M, Kårlund A, Hakkila K, Tyystjärvi E, **Tyystjärvi T** (2016)

Roles of group 2 sigma factors in acclimation of the cyanobacterium *Synechocystis* sp. PCC 6803 to nitrogen deficiency. **Plant and Cell Physiology** **57**: 1309-1318.

Rantamäki S, Meriluoto J, Spoof L, Puputti E-M, **Tyystjärvi T**, Tyystjärvi E (2016) Oxygen produced by cyanobacteria in simulated Archaean conditions partly oxidizes ferrous iron but mostly escapes - conclusions about early evolution, **Photosynthesis Research** **130**: 103-111.

Koskinen S, Hakkila K, Gunnelius L, Kurkela J, Wada H, **Tyystjärvi T** (2016) *In vivo* recruitment analysis and a mutant strain without any group 2 σ factor reveal roles of different σ factors in cyanobacteria. **Molecular Microbiology** **99**: 43-54.

Gunnelius L, Kurkela J, Hakkila K, Koskinen S, Parikainen M, **Tyystjärvi T** (2014) The ω subunit of RNA polymerase is essential for thermal acclimation of the cyanobacterium *Synechocystis* sp. PCC 6803. **PloS ONE** **9(11)**:e112599.

Gunnelius L, Hakkila K, Kurkela J, Wada H, Tyystjärvi E, **Tyystjärvi T** (2014) The omega subunit of RNA polymerase core directs transcription efficiency in cyanobacteria. **Nucleic Acids Research** **42**: 4606-4614.

Hakkila K, Antal T, Rehman AU, Kurkela J, Wada H; Vass I, Tyystjärvi E, **Tyystjärvi T** (2014) Oxidative stress and photoinhibition can be separated in the cyanobacterium *Synechocystis* sp. PCC 6803. **Biochemica et Biophysica Acta** **1837**: 217-225.

Hakkila K, Antal T, Gunnelius L, Kurkela J, Matthijs HCP, Tyystjärvi E, **Tyystjärvi T** (2013) Group 2 sigma factor mutant Δ sigCDE of the cyanobacterium *Synechocystis* sp. PCC 6803 reveals functionality of both carotenoids and flavodiiron proteins in photoprotection of photosystem II. **Plant and Cell Physiology** **54**: 1769-1779.

Tyystjärvi T, Huokko T, Rantamäki S, Tyystjärvi E (2013) Impact of different group 2 sigma factors on light use efficiency and high salt stress in the cyanobacterium *Synechocystis* sp. PCC 6803. **PloS ONE** **8(4)**:e63020.

Antal T, Harju E, Pihlgren L, Lastusaari M, **Tyystjärvi T**, Hölsä J, Tyystjärvi E (2012): Use of near-infrared radiation for oxygenic photosynthesis via photon up-conversion. **International Journal of Hydrogen Energy** **37**: 8859-8863.

Nikkinen H-L, Hakkila K, Gunnelius L, Huokko T, Pollari M, **Tyystjärvi T** (2012): The SigB σ factor regulates multiple salt acclimation responses of the cyanobacterium *Synechocystis* sp. PCC 6803. **Plant Physiology** **158**: 514-523.

Hakala-Yatkin M, Sarvikas P, Paturi P, Mäntysaari M, Mattila H, **Tyystjärvi T**, Nedbal L, Tyystjärvi E (2011): Magnetic field protects plants against high light by slowing down production of singlet oxygen. **Physiologia Plantarum** **142**:26-34.

Pollari M, Rantamäki S, Huokko T, Kårlund-Marttila A, Virjamo V, Tyystjärvi E, **Tyystjärvi T** (2011): Effects of deficiency and overdose of group 2 sigma factors in triple inactivation strains of *Synechocystis* sp. PCC strain 6803. **Journal of Bacteriology** **193**: 265-273.

Antal T, Mattila H, Hakala-Yatkin M, **Tyystjärvi T**, Tyystjärvi E (2010): Acclimation of photosynthesis to nitrogen deficiency in *Phaseolus vulgaris*. **Planta** **232**: 887-898.

Sarvikas P, **Tyystjärvi T**, Tyystjärvi E (2010): Kinetics of prolonged photoinhibition revisited:

Photoinhibited photosystem II centres do not protect the active ones against loss of oxygen evolution. **Photosynthesis Research** **103:7-17**.

Gunnelius L, Tuominen I, Rantamäki S, Pollari M, Ruotsalainen V, Tyystjärvi E, **Tyystjärvi T** (2010): SigC sigma factor is involved in acclimation to low inorganic carbon at high temperature in *Synechocystis* sp. PCC 6803. **Microbiology** **156: 220-229**.

Pollari M, Ruotsalainen V, Rantamäki S, Tyystjärvi E, **Tyystjärvi T** (2009) Simultaneous inactivation of sigma factors B and D interferes with light acclimation of the cyanobacterium *Synechocystis* sp. strain PCC 6803. **Journal of Bacteriology** **12: 3992-4001**.

Pollari M, Gunnelius L, Tuominen I, Ruotsalainen V, Tyystjärvi E, Salminen T, **Tyystjärvi T** (2008) Characterization of single and double inactivation strains reveals new physiological roles for group 2 sigma factors in the cyanobacterium *Synechocystis* sp. PCC 6803. **Plant Physiology** **147: 1994-2005**

Tuominen I, Pollari M, von Wobeser EA, Tyystjärvi E, Ibelings BW, Matthijs HCP, **Tyystjärvi T** (2008) Sigma factor SigC is required for heat acclimation of the cyanobacterium *Synechocystis* sp. strain PCC 6803. **FEBS Letters** **582: 346-350**

Tuominen I, Pollari M, Tyystjärvi E, **Taina Tyystjärvi** (2006) The SigB sigma factor is involved in high temperature responses in the cyanobacterium *Synechocystis* sp. PCC6803. **FEBS Letters** **580: 319-323**.

Sarvikas P, Hakala M, Pätsikkä E, **Tyystjärvi T**, Tyystjärvi E (2006) Action spectrum of photoinhibition in leaves of npq1-2 and npq4-1 mutant of *Arabidopsis thaliana*. **Plant and Cell Physiology** **47: 391-400**.

Hakala M, Rantamäki S, Puputti E-M, **Tyystjärvi T**, Tyystjärvi E (2006) Photoinhibition of manganese enzymes: insights into the mechanism of photosystem II photoinhibition. **Journal of Experimental Botany** **57: 1809-1816**.

Hakala M, Tuominen I, Keränen M, **Tyystjärvi T**, Tyystjärvi E (2005) Evidence for the role of the oxygen-evolving manganese complex in photoinhibition of Photosystem II. **Biochimica et Biophysica Acta** **1706: 68-80**.

Herranen M, **Tyystjärvi T**, Aro E-M (2005) Regulation of photosystem I reaction center genes in *Synechocystis* sp. strain PCC6803 during light acclimation. **Plant and Cell Physiology** **46: 1484-1493**.

Tyystjärvi T, Sirpiö S, Aro E-M (2004) Post-transcriptional regulation of *psbA* gene family in the cyanobacterium *Synechococcus* sp. PCC 7942. **FEBS Letters** **576: 211-215**.

Tuominen I, Tyystjärvi E, **Tyystjärvi T** (2003) Expression of primary sigma factor (PSF) and PSF-like sigma factors in the cyanobacterium *Synechocystis* sp. strain PCC 6803. **Journal of Bacteriology** **185: 1116-1119**

Sakurai I, Hagio M, Gombos Z, **Tyystjärvi T**, Paakkarinen V, Aro E-M, Wada H (2003) Requirement of Phosphatidylglycerol for Maintenance of Photosynthetic Machinery. **Plant Physiology** **133: 1376-1384**.

Mulo P, Pursiheimo S, Hou C-X, **Tyystjärvi T**, Aro E-M (2003) Multiple effects of antibiotics

on chloroplast and nuclear gene expression. **Functional Plant Biology** 30: 1097-1103.

Tyystjärvi T, Tuominen I, Herranen M, Aro E-M, Tyystjärvi E (2002) Action spectrum of *psbA* gene transcription is similar to that of photoinhibition in *Synechocystis* sp. PCC 6803. **FEBS Letters** 516: 167-171

Guiamét J, Tyystjärvi E, **Tyystjärvi T**, John I, Kairavuo M, Pichersky E and Noodén L (2002) Photoinhibition and loss of photosystem II center proteins during senescence of soybean leaves. Enhancement of photoinhibition by the stay-green mutation *cytG*. **Physiologia Plantarum** 115: 468-478

Tyystjärvi T, Herranen M, Aro E-M (2001) Regulation of translation elongation in cyanobacteria: membrane targeting of the ribosome nascent chain complexes controls the synthesis of D1 protein. **Molecular Microbiology** 40: 476-484

Herranen M, Aro E-M, **Tyystjärvi T** (2001) Two distinct mechanisms regulate the transcription of Photosystem II genes in *Synechocystis* sp. PCC 6803. **Physiologia Plantarum** 112: 531-539.

Tyystjärvi T, Tyystjärvi E, Ohad I, Aro E-M (1998) Exposure of *Synechocystis* 6803 cells to series of single turnover flashes increases the *psbA* transcript level by activating transcription and down-regulating *psbA* mRNA degradation. **FEBS Letters** 436: 483-487

Mulo P, **Tyystjärvi T**, Tyystjärvi E, Govindjee, Mäenpää P and Aro E-M (1997) Mutagenesis of the D-E loop of photosystem II reaction centre protein D1. Function and assembly of photosystem II. **Plant Molecular Biology** 33: 1059-1071

Salih G, Wiklund R, **Tyystjärvi T**, Mäenpää P, Gerez C and Jansson C (1996) Constructed deletions in lumen-exposed regions of the D1 protein the cyanobacterium *Synechocystis* 6803: Effects on D1 insertion and accumulation in the thylakoid membrane and on photosystem II assembly. **Photosynthesis Research** 49: 131-140

Tyystjärvi T, Mulo P, Mäenpää P and Aro E-M (1996) D1 polypeptide degradation may regulate *psbA* gene expression at transcriptional and translational levels in *Synechocystis* sp. PCC 6803. **Photosynthesis Research** 47: 111-120

Mäenpää P, Miranda T, Tyystjärvi E, **Tyystjärvi T**, Govindjee, Ducruet J-M, Etienne A-L and Kirilovsky D (1995) A mutation in the D-*de* loop of D₁ modifies the stability of the S₂Q_A⁻ and S₂Q_B⁻ states in Photosystem II. **Plant Physiology** 107: 187-197.

Tyystjärvi T, Aro E-M, Jansson C and Mäenpää P (1994) Changes of amino acid sequence in PEST-like area and QEEET motif affect degradation rate of D1 polypeptide in photosystem II. **Plant Molecular Biology** 25: 517-526.

Mäenpää P, **Kallio T**, Mulo P, Salih GF, Aro E-M, Tyystjärvi E and Jansson C (1993) Site-specific mutations in the D1 polypeptide affect the susceptibility of *Synechocystis* 6803 cells to photoinhibition. **Plant Molecular Biology** 22: 1-12.

2. Conference proceedings with referee practice

Pollari M and **Tyystjärvi T** (2008) The SigB sigma factor of the cyanobacterium *Synechocystis* sp. PCC 6803 is necessary for adaptation to high-salt stress. - In: Photosynthesis. Energy from the Sun. 14th International Congress on Photosynthesis Research, Glasgow 22-27 July 2007.

Allen, J.F., Gantt, E., Golbeck, J.H., Osmond, B. (eds.). Springer, Heidelberg, ISBN: 978-1-4020-6707-5.

Tyystjärvi E, Hakala, M and **Tyystjärvi T** (2008) Quenching of chlorophyll fluorescence by exciton annihilation does not protect against Laser-pulse-induced photoinhibition. - In: Photosynthesis. Energy from the Sun. 14th International Congress on Photosynthesis Research, Glasgow 22-27 July 2007. Allen, J.F., Gantt, E., Golbeck, J.H., Osmond, B. (eds.). Springer, Heidelberg, ISBN: 978-1-4020-6707-5.

3. Scientific monographs.

Tyystjärvi T (1996) Expression of *psbA* gene encoding photosystem II reaction centre polypeptide D1 in cyanobacterium *Synechocystis* sp. PCC 6803. **Doctoral Thesis. Ann. Univ. Turkuensis Ser A II: 84.** Turku. 57 p + 5 research papers

4. Conference proceedings

Tyystjärvi T, Herranen M, Mulo P, Ohad I and Aro E-M (1998) Regulation of *psbA* gene expression in *Synechocystis* 6803. **In: Garag G (ed.) Photosynthesis: Mechanisms and Effects, Vol. IV.** Kluwer Academic Publishers, Dordrecht, pp. 2909-2912.

Herranen M, Aro E-M and **Tyystjärvi T** (1998) Expression of PSII and PSI genes in *Synechocystis* 6803. **In: Garag G (ed.) Photosynthesis: Mechanisms and Effects, Vol. IV.** Kluwer Academic Publishers, Dordrecht, pp. 2913-2916.

Kettunen R, Mulo P, **Tyystjärvi T**, Aro E-M and Mäenpää P (1997) Conformation of the DE-loop is crucial for proteolytic degradation of Photosystem II reaction centre protein D1. **In: VK Hopsu-Havu et al. (eds) Proteolysis and Cell Functions.** IOS Press. P. 112-119

Tyystjärvi T, Mäenpää P and Aro E-M (1995) Regulation of D1 polypeptide synthesis in *Synechocystis* 6803. **In P. Mathis (ed.) Photosynthesis: from Light to Biosphere. Vol 3.** Kluwer Academic Publishers. Dordrecht. pp. 489-492.

Susanne Rantamäki and **Taina Tyystjärvi** (2011): Light acclimation of triple inactivation strains of group 2 sigma factors in *Synechocystis* sp. strain PCC 6803. Proceedings of the 15th International Congress on Photosynthesis.