



**University of
Zurich**^{UZH}

**Zurich Open Repository and
Archive**

University of Zurich
Main Library
Strickhofstrasse 39
CH-8057 Zurich
www.zora.uzh.ch

Year: 2010

Characterization of bioactive cyclic oligopeptides of freshwater cyanobacteria (microcystins, cyanopeptolins, cyclamides)

Blom, Judith F ; Höger, Stefan J ; Jüttner, Friedrich

Abstract: Cyanobacteria produce a variety of unusual secondary metabolites, the function of some of them still remains unclear. Research in the last years has primarily focused on cyanobacterial microcystins that have severe impact on humans and livestock. While at the beginning the main focus point was on the structure elucidation and functionality of microcystins, in recent years also cyanopeptolins and cyclamides have become important issues. Today also the possible ecological role of these metabolites is an attractive goal of research. In this protocol methods for the extraction, determination, and quantification using high-performance liquid chromatography (HPLC), liquid chromatography-mass spectrometry (LC-MS), and gas chromatography-mass spectrometry (GC-MS) are described as well as methods (bioassay-guided fractionation, enzyme linked immunosorbent assay) to find toxins and protease inhibitors in cyanobacterial extracts. In addition, methods for the determination of the molar absorption coefficient, necessary for the quantification of small amounts of the oligopeptides, are described.

Posted at the Zurich Open Repository and Archive, University of Zurich

ZORA URL: <https://doi.org/10.5167/uzh-46454>

Book Section

Originally published at:

Blom, Judith F; Höger, Stefan J; Jüttner, Friedrich (2010). Characterization of bioactive cyclic oligopeptides of freshwater cyanobacteria (microcystins, cyanopeptolins, cyclamides). In: Bagchi, S N; Kleiner, D; Mohanty, P. Protocols on algal and cyanobacterial research. New Delhi, India: Narosa Publishing, 53-70.

Protocols on Algal and Cyanobacterial Research

Editors

Suvendra Nath Bagchi

Diethelm Kleiner

Prasanna Mohanty



Alpha Science International Ltd.

Oxford, U.K.

Contents

<i>Foreword</i>	v
<i>Preface</i>	vii
<i>List of Contributors</i>	xv

Section 1: Preparation and Description of Components

Advanced Laboratory Course of Methods used in Standard Cyanobacterial Research	1
<i>Klaus-Peter Michel, Suvendra N. Bagchi and Elfriede K. Pistorius</i>	
Characterization of Bioactive Cyclic Oligopeptides of Freshwater Cyanobacteria (Microcystins, Cyanopeptolins, Cyclamides)	53
<i>Judith F. Blom, Stefan J. Höger and Friedrich Jüttner</i>	
Isolation and Characterization of Cyanobacterial Polar Lipids with Bioactivity towards Platelet Aggregation	71
<i>Smaragdi Antonopoulou, Tzortzis Nomikos, Elizabeth Fragopoulou and Haralabos C. Karantonis</i>	
Carotenoid Production and Characterization in Cultured <i>Haematococcus pluvialis</i>	102
<i>R. Sarada, R. Vidhyavathi and G.A. Ravishankar</i>	
Protocol for Cyanobacterial Proteomics I	113
<i>Yogesh Mishra, Poonam Bhargava, Neha Chaurasia, Om Prakash Narayan, Nidhi Kumari and Lal Chand Rai</i>	
Cyanobacterial Proteomics- Protocol II: Alternatives to Gel Electrophoresis and Methods of Protein Identification	129
<i>Yogesh Mishra, Poonam Bhargava, Neha Chaurasia, Om Prakash Narayan, Nidhi Kumari and Lal Chand Rai</i>	
Purification and Characterization of Photosystem I Light Harvesting Complex I Supercomplexes from <i>Chlamydomonas reinhardtii</i>	138
<i>Rajagopal Subramanyam, Petra Fromme and Andrew N. Webber</i>	
Isolation of Phycobilisomes from Cyanobacteria and Red Algae	148
<i>Prasanna Mohanty, S. Rajagopal and I.B. Jha</i>	

Section 2: Assessment of Biological Activities

- Ammonium Transport in Cyanobacteria and Microalgae—
Basic Protocols and Accurate Guidance** 160
D. Kleiner
- Analysis of the Adaptive Phosphate Uptake Behaviour in Respect to
Cellular Information Processing about an Environmental Alteration** 166
R. Falkner and G. Falkner
- Assay Methods for Nitrate Assimilatory Enzymes in
Spirulina (*Arthospira*)** 179
*Sunila Lochab, Ahmad Ali, Pamela Jha, Vivek Sharma,
Deepti Abbey and N. Raghuram*
- A Cell Pressure Probe for Measuring Water Relations in Algal Cells** 190
Ewa Przedpelska
- Methods for Assessment of Activity and Stress Acclimation of
Photosynthetic Machinery in Cyanobacteria and
Symbiotic Microalgae** 195
*Karl Y. Biel, Irina R. Fomina, Vladimir D. Kreslavski
and Suleyman I. Allakhverdiev*
- Spectrophotometric Quantification of Photochemical Active Reaction
Centers of Photosystem II by Reversible Photoreduction of Pheophytin
in Cells of Green Algae and Cyanobacteria** 215
*Vyacheslav V. Klimov, Sergey K. Zharmukhamedov
and Suleyman I. Allakhverdiev*
- Chlorophyll *a* Fluorescence: A Sensitive Reporter of Osmotic
Properties and Permeability Properties of Cyanobacterial Cells** 225
George C. Papageorgiou and Kostas Stamatakis

Section 3: Toxins

- Analysis of Cyanobacterial Neurotoxins** 240
*Renato Molica, Ernani Pinto, Paula Kujbida, Eduardo Alécio
and Denise Dagnino*
- Toxicity Evaluation of Cyanobacterial Toxins** 262
P.V. Lakshmana Rao, R. Jayaraj and A.S.B. Bhaskar
- Zooplankton-based Bioassay for Investigating Toxic Cyanobacteria** 281
Manish K. Agrawal
- Toxic Effects of Cyanobacterial Toxins on Fish** 289
Meriç Albay, Reyhan Akçaalan and Angeles Jos

Contents	xiii
Rapid and Sensitive Detection of Microcystin Producing Water Blooms using PCR and MALDI-TOF MS	300
<i>Suvendra N. Bagchi and Shubhro K. Ghosh</i>	
Section 4: Biotechnology	
Use of the Green Alga <i>Scenedesmus</i> sp. in Studying Metal Ion Toxicity Symptoms: Assay of Physiological Parameters	309
<i>B.N. Tripathi, Anshu Amar and J.P. Gaur</i>	
Protocols for the Isolation and Characterization of <i>Chlorella</i>, Growing in the Effluents of Paper-Pulp and Electroplating Industry	324
<i>Swati N. Yewalkar, Kondiram N. Dhumal, Gururaj B. Maralihalli and Jayashree K. Sainis</i>	
Strategies to Remove Fluoride through Biosorption over Algal Biomass	336
<i>Monica Bhatnagar and Ashish Bhatnagar</i>	
<i>Appendix</i>	<i>348</i>
<i>Index</i>	<i>349</i>