

## Structure and purpose of this thesis

The present study is being submitted as Ph.D. thesis at Department of Botany and Zoology, Faculty of Science, Masaryk University in Brno, Czech Republic. According to the valid "Educational and examinational rules" Faculty of Science, the thesis is composed from an introduction and a set of published scientific papers and manuscripts of scientific papers.

In Introduction, Chapter 1, I shortly summarize the current knowledge about the cyanobacterial taxonomy, toxicology and autecology. The largest part of this Chapter is concern on *Microcystis* genus.

Chapter 2 (Šejnohová, L.; Neméthová, D., Welker, M., Maršálek, B. (submitted): *Cell diameter by the bloom-forming cyanobacterium Microcystis correlates with the occurrence of specific toxic oligopeptides within the season.* - *Journal of Phycology*) analyzed the relationship between morphology and oligopeptides occurrence by *Microcystis* genus. This study represents the first work tested direct the relationship between individual morphological features of colony and individual peptides by using multivariate analysis. The novel method, mass spectrometry (MALDI-TOF MS), analyzed single colonies were used. We hypothesis that occurrence of peptides in *Microcystis* colony could be potentially used in polyphasic taxonomy on subgeneric level.

The idea that *Microcystis* reinvasion should be result of endogenous timing is studied in Chapter 3 (Šejnohová, L.; Maršálek, B., Drábková, M. (submitted): *Reinvasion of Microcystis colonies (Cyanobacteria) - changes in cell numbers, form of colony and ultrastructure in different conditions.* - *Hydrobiologia*). We compared the changes of *Microcystis* cell numbers, size of colony and ultrastructural changes in sediment in reservoir and stable condition of refrigerator.

In Chapter 4 (Welker, M.; Šejnohová, L.; Neméthová, D.; van Dohren, H., Jarkosvký, J., Maršálek, B.: *Seasonal shifts in chemotype composition of Microcystis sp. communities in the pelagial and the sediment of a shallow reservoir.* - *Limnology and Oceanography* 52(2007): 609-619), we investigate dynamics, diversity and co-occurrence of oligopeptides by *Microcystis* community within the season. The term chemotype applied in this study refers thus to colonies having the same peptide pattern in mass spectra. The main aim of this paper was to determined the seasonal changes of chemotypes in the pelagial and sediment with a view to the reinvasion and sedimentation.

In Chapter 5 (Welker, M.; Maršálek, B.; Šejnohová, L.; van Dohren, H.: *Detection and identification of oligopeptides in Microcystis (cyanobacteria) colonies: Toward an understanding of metabolic diversity.* - *Peptides* 27 (2006): 2090-2103), we report on the mass spectral analysis of cyanobacterial peptides in individual colonies of *Microcystis* genus. The purpose of this paper was to describe a high diversity of potentially bioactive compounds by *Microcystis* genus. We alert that beside the

microcystins also aeruginosins, anabaenopeptins, microginins and microviridins could be more frequent cyanotoxins in *Microcystis* community.

In general discussion, in Chapter 6, the main results of the topics investigated in this thesis are placed in perspective with current knowledge and where need, further discussed. Additionally, the questions arising from this work and the taxonomical implications of my findings are presented.

## **Aims of the present study**

The central aim of this dissertation was to contribute to ongoing research on the bloom forming cyanobacteria with a view to the taxonomy and autecology of the most frequent genus *Microcystis*, namely to:

### 1) Cyanobacterial taxonomy

a) To test the relationship between oligopeptides occurrence and individual morphological characters within *Microcystis* genus on single-colonies by mass spectrometry (MALDI-TOF MS) and multivariate analysis. We hypothesis that occurrence of peptides in *Microcystis* colony could be potentially used in polyphasic taxonomy on subgeneric level (Chapter 2).

b) Description of the whole spectrum of oligopeptides by *Microcystis* and investigation of their seasonal shift (Chapter 4, Chapter 5)

### 2) Autecology

Investigation of *Microcystis* ultrastructure and number of cells in sediment during the reinvasion in the different parts of reservoir and compare it with the simultaneous observation in the in stable condition of refrigerator. There is a question about the exo- and endogenous timing during the *Microcystis* reinvasion (Chapter 3).