EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

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Cyanobacterial blooms and toxins in water resources:
Occurrence, impacts and management

Short Term Scientific Mission (STSM)

Seasonal variation of cyanotoxins and toxic genotypes detection of cyanobacteria in hypertrophic lake

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Objectives

1. Determination and quantification of microcystins in environmental samples and cyanobacteria strains using LC–MS technique.
2. Identification and quantification of genes responsible for microcystins, saxitoxins, anatoxins synthesis in environmental samples and cyanobacteria strains.

Methodology

Sampling. Surface water samples were collected biweekly in shallow Lake Širvys (Fig. 1) from April to October, 2014. Samples were filtered through GF/F filters and stored at -20˚C.
Microcystins determination and quantification. Frozen samples were extracted with 70% methanol and analysed using LC–MS device.
DNA extraction. Genomic DNA extracted using DNA isolation Kits.
Molecular analysis. Microcystin *mcyE*, anatoxin–a and saxitoxin *sxtA* synthetase genes detection performed using specific primers. *Planktothrix agardhii mcyE* copy numbers in field samples were determined using qPCR method (Vaitomaa et al., 2003; Rantala et al., 2006; Rantala et al., 2008; Al-Tebrineh et al., 2010; Rantala-Ylinen et al., 2011).

Results

Two variants of microcystins were found in all 13 samples. The highest total concentrations were determined in September–October (Fig. 2). Microcystin–RR dominated over microcystin–LR through the vegetation season.

Planktothrix agardhii and *Microcystis* spp. *mcyE* gene were detected in all field samples. *P. agardhii*, *Dolichospermum crassum*, *Microcystis* spp. 181 strains (isolated from the lake) were examined for microcystin synthetase gene E presence. *P. agardhii* was primary species acquiring the *mcyE* gene. Moreover, high copy numbers (up to 26 × 10^5 ml^{-1}) of *mcyE* gene in field samples were determined. The results ascertained that *P. agardhii,* which dominated in phytoplankton, could be the main microcystin producer in Lake Širvys.

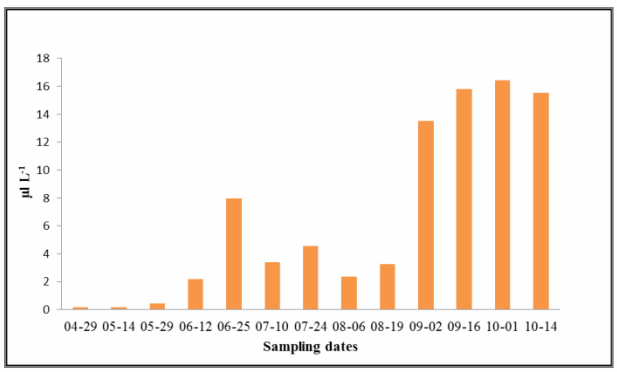

Fig. 2. Total concentrations of intracellular microcystin in field samples of Lake Širvys.

Anatoxin–a synthetase gene was not found in the plankton samples and in the strains. Saxitoxin *sxtA* synthetase gene was detected in field samples from end of July till the end of October (Fig. 3).

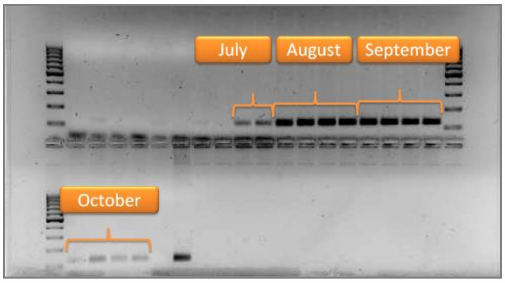

Fig. 3. Detection of saxitoxin *sxtA* syntethase gene in field samples of Lake Širvys.

Fig. 1. Lake Širvys, Lithuania.

References
Al-Tebrineh J. et al., 2010. Appl. Environ. Microbiol. 76(23):7836–7842.
Rantala A. et al., 2006. Appl. Environ. Microbiol. 72(9):6101–6110.
Rantala A. et al., 2008. Environ. Microbiol. 10(3):653–664.
Rantala-Ylinen A. et al., 2011. Appl. Environ. Microbiol. 77:7271–7278.
Vaitomaa J. et al., 2003. Appl. Environ. Microbiol. 69:7289–7297.

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