

ENVIRONMENTAL HEALTH RISK FACTORS

DETERMINATION OF CYANOTOXINS PRESENT IN WATER ACCUMULATIONS ON TERRITORY OF THE REPUBLIC OF SERBIA

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Background: A worldwide problem with numerous adverse effects on aquatic ecosystems and drinking water resources is caused by algal bloom. Reduce in the quality of freshwater bodies, such as lowered dissolved oxygen and changes in color, odor, and taste of water, could be caused by cyanobacterial bloom. Cyanobacterial produce toxins that are the main concern. Toxic compounds identified on the territory of the Republic of Serbia were: microcystines (MC RR, MC DMRR, MC LR, MC DMLR, MC YR), cilindrospermopsin (CYN) and anatoxin (ATX). The presence of identified toxins requires their concentration monitoring.

Methods and Objectives: Method for the determination of cyanotoxins was developed using liquid chromatography with mass spectrometry (LC-MS). Gradient method elution was employed using A: 0.1% formic acid in water and B: 0.1% formic acid in acetonitrile: 0 min 21% B, 18 min 72% B, 20 min 72%, 20.1 min 21%, 25 min 21% end. Flow rate was 0.350 ml/min, on Acclaim Polar Advantage II (Thermo Scientific) column. Samples were prepared by filtration and solid phase extraction, using hydrophylic-lipophylic (HLB) and porous graphite carbon (PGC) cartridges. Single ion monitoring (SIM) method was engaged for detection and quantitation using mass-to-charge ratio (m/z): MC RR-520, MC DMRR-512, MC LR-996, MC DMLR-982, MC YR-1046, CYN-416, and ATX-166.

Results: Microcystin's, cilindrospermopsin and anatoxin were detected during the past 5 years. Concentration ranges found, in µg/L, were: MC RR (0.005-0.830), MC LR (0.012-1.454), MC DMRR (0.005-0.530), MC DMLR (0.003-0.896), MC YR (0.007-0.998), CYN (0.009-0.686) and ATX (0.004-0.491). Concentrations found in some samples were above the recommendations of 1 µg/L (WHO guideline 2021). Fortunately, those samples were from water accumulations that were not used for purposes of drinking water production.

Conclusions: Monitoring the presence and the amount of cyanobacterial toxic compounds in water accumulations, especially used in the water production process, is crucial for the public health of one country.

Keywords: Algae bloom, toxins, LC-MS, microcystin, anatoxin