

## Abstract

# Presence of *Microcystis* sp. and Microcystins in Alqueva Reservoirs Assessed by Chemical and Molecular Methods <sup>†</sup>

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**Abstract:** The Alqueva reservoir, located in the Alentejo region, in the south of Portugal, is considered the largest artificial lake in Europe. It has been in operation since 2002, and it is used to produce energy and supply water for agriculture and to the populations in this region of Portugal. The water distribution system, starting from the main reservoir, includes 19 reservoirs of smaller capacity and a network of waterways totaling 382 km in length. Furthermore, the occurrence of cyanobacteria in water reservoirs has been recognized as an environmental concern due to the potential presence of their related toxins that can cause severe health effects. This work aimed to monitor the presence of cyanobacteria and the commonly associated cyanotoxin microcystin (MC) in three reservoirs belonging to the Alqueva water system, namely São Pedro, Magra, and Pisão, located in the district of Beja. These reservoirs were selected considering the historical data of phytoplankton provided by EDIA, the entity in charge of the management of this infrastructure. The field work was carried out in July, August, and September, the months with the highest risk of outgrowth of cyanobacteria, in the year 2020. Two or three samples of water (5 L) were collected in different locations of the reservoirs, once per month, by boat. Samples were collected at different depths in the photic zone using a Van Dorn bottle and pooled. The water samples were then processed in the laboratory. Molecular biology techniques were used to detect the presence of cyanobacteria (16S rRNA) and MC-related genes. Moreover, chemical analysis techniques based on liquid chromatography and mass spectrometry (MS) were used to identify and quantify MCs. The results revealed the presence of MCs in the three reservoirs in the three months monitored. Concentrations of this toxin varied between 0.01 µg/L and 0.1 µg/L, with São Pedro being the reservoir displaying the highest concentrations of MCs in all of the months monitored. These results are consistent with the molecular study based on the analysis of *Microcystis* sp. 16 rRNA and MC biosynthetic genes (*mcyA–mcyG*), suggesting the presence of putative toxic *Microcystis* sp. strains in the three reservoirs. Despite the low concentrations of MCs detected in these reservoirs, their recurrent presence in Alqueva waters serve as a reminder of the need to monitor cyanobacteria and cyanotoxins on a regular basis.

**Keywords:** toxic cyanobacteria; cyanotoxins; water quality; Alqueva; crop irrigation



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