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Abstract

The Problem of Cyanotoxins in Reservoirs of São Paulo State, Brazil †

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Abstract: Eutrophication process and phytoplankton primary productivity have intensified in continental aquatic ecosystems because of climate change. As a consequence, the proliferation of potentially toxic cyanobacteria is increasing in frequency, magnitude, and duration. For water sources used in public supply, this growth represents an ecological risk to ecosystems and human health. From October 2021 to February 2022, integrated samples of surface water were obtained from 11 reservoirs in São Paulo State, Brazil (Jaguari, Jacarei, Atibainha, Paiva Castro, Rio Grande, Guarapiranga, Barra Bonita, Bariri, Broa, Salto Grande, and Itupararanga). Limnological variables were obtained using the Troll 500 probe, in addition to depth, turbidity (Tur), chlorophyll a (Chla), and phycocyanin (Phy) concentrations (Turner C3 probe). In the laboratory, chlorophyll-a concentrations (ChlaABS) were analyzed. Phytoplankton biovolume (Utermöhl method) was estimated. The concentrations of microcystins (MCs) and saxitoxins (STXs) were analyzed with Beacon kits, in ELISA microplate reader. For the studied reservoirs, the Secchi disc water transparency ranged from 0.6 to 2.3 m. The average values of water temperature, electrical conductivity, pH, and dissolved oxygen were, respectively, 24.8 °C, 162.9 µS/cm, and 8.4 and 9.5 mg/L. For Tur, Chla, Phy, and ChlaABS, ranged from 1.86 to 24.6 NTU, 3.3 to 105.1 µg/L, 12.4 to 445.2 µg/L, and 4.2 to 84.9 µg/L, respectively. Cyanobacteria was the more representative phytoplankton class in biovolume, from 0.07 to 51.7 mm^3/L. STXs and MCs were found in most sampled stations. For STXs it ranged from 0.016 µg/L to 0.308 µg/L, and for MCs in some stations it was higher than 200 µg/L. According to the World Health Organization and Brazilian legislation, in the 11 studied reservoirs, the concentrations of saxitoxins are within the maximum allowed limits (3 µg/L), while for microcystins the concentrations are for most reservoirs above the maximum allowed value (1 µg/L). Considering the analyzed information in relation to water quality and the cyanobacterial community, we verify that most of these environments present a worrying water quality, which can represent a risk for public health.

Keywords: reservoirs; eutrophication; cyanobacteria; cyanotoxins

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