Conundrum of cyanobacterial blooms in small and shallow waters



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MER BLOOM?











www.ehp.niehs.nih.gov *Microcystis* bloom in North Carolina



WHAT IS A WATER BLOOM?

A water bloom is a dense population of algae or cyanobacteria creating discoloured water.

The negative consequences of bloom are:

- depletion of oxygen content,
- releasing of toxins,
- poisoning of aquatic animals and waterfowl,
- irritating the skin and respiratory tract of humans,
- •... and many others.



WHERE ARE WATER BLOOMS PRESENT?



CYANOBACTERIA

Photosynthetic and oxygen-producing bacteria

Known for more than 3 mln years

Thanks to them, oxygen conditions appeared on Earth

Possess dyes: phycocyanin, phycoerythrin, chlorophyll a, and carotenoids









Processes and phenomena that increase Cyanobacterial blooms



External

EUTROPHICATION

Loading phosphorus (P) and nitrogen (N)

Internal



Paerl, H.W., Scott, J.T., McCarthy, M.J., Newell, S.E., Gardner, W.S., Havens, K.E., Hoffman, D.K., Wilhelm, S.W. and Wurtsbaugh, W.A., 2016. It takes two to tango: When and where dual nutrient (N & P) reductions are needed to protect lakes and downstream ecosystems. *Environmental Science & Technology*, *50*(20), pp.10805-10813.

VALUES OF EUTROPHICATION PARAMETERS ACCORDING TO OECD CLASSIFICATION

TP 0.035-0.1 mg/L - Eutrophy Chlorophyll *a* 8-25 µg/L - Eutrophy



It takes two to tango



Paerl, H.W., Scott, J.T., McCarthy, M.J., Newell, S.E., Gardner, W.S., Havens, K.E., Hoffman, D.K., Wilhelm, S.W. and Wurtsbaugh, W.A., 2016. It takes two to tango: When and where dual nutrient (N & P) reductions are needed to protect lakes and downstream ecosystems. *Environmental Science & Technology*, *50*(20), pp.10805-10813.

TAKING BIOMASS OF CYANOBACTERIA OUT





1 kg of phytoplankton biomass =



= up to 2 kg C = up to 0.1 kg N = up to 0.02 kg P

Microcystins µg/L in cells



WHO guidance cyanotoxins (MC -LR) in drinking water (free+cell bound)

ADVANTAGE

Cyanobacteria are a rich source of biologically active compounds. Many of them are used in medicine, cosmetics and agriculture.

They are used to enrich the soil with nitrogen compounds (increase rice yield by about 20%), as well as herbicides and insecticides.

Cyanobacterial metabolites are immunosuppressants, antibacterial drugs, anti-cancer drugs; synthetic analogues of cyanobacterial peptides are tested as antifungal agents of blond.

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THANK YOU!

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