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Plants provide 'green liver' by removing water toxins

Blue-green algae, or 'aquatic cyanobacteria', can produce harmful toxins and present a serious health hazard when they bloom in large numbers. Researchers from Germany have now identified plant species that could be used to sustainably treat water by removing such cyanobacterial toxins.

Cyanobacteria are common in water bodies with high nutrient load. Some cyanobacteria can produce the harmful neurotoxin β-N-Methylamino-L-alanine (BMAA), which has been linked to Parkinson's disease. Treatments to remove such toxins and ensure safe drinking water can be costly and difficult, however, it has been suggested that some plants may be able to filter and store such toxins, providing a low-cost 'green liver'.

In this study, researchers examined how efficient four species of aquatic plants were at removing and storing BMAA. These were: liverwort moss, willow moss, crystalwort and Java moss. In a laboratory experiment, the plants were exposed to water-borne concentrations of BMAA of 100 micrograms per litre (μg L^{-1}). After one, three, seven and 14 days, the concentrations of BMAA in both the surrounding water and the plants themselves were measured.

The results demonstrated that the plants substantially reduced toxin concentrations in the water. After only one day the plants reduced the toxin from 100 μg L^{-1} to less than 32 μg L^{-1}. Liverwort moss, crystalwort and Java moss were the most effective, and after 14 days were able to remove up to 97% of toxin from the water, reducing concentrations to 3 (liverwort moss), 1.5 (crystalwort), and 3.5 (Java moss) μg L^{-1}.

Toxin concentrations in the plants themselves were greatest in those that removed the most from the water, showing that the capacity to remove the toxin from the water was linked to the ability to store it in plant tissues. If the plants were used in water treatment, they may therefore need to be removed and burnt, or otherwise disposed before decaying and allowing toxins to re-enter the environment.

The researchers acknowledge that the experiment was relatively short-term and stress that further studies are needed to assess how long such plants can effectively remove toxins before they need to be removed. In addition, they caution that when selecting plants for remediating contaminated water, they must be suited to the environmental conditions, such as temperature or water flow.

Overall, the researchers conclude that use of plants may be a valuable, low-cost method for water remediation. They also add that different species of plants may be combined to provide effective treatment for a range of contaminants. For example, other aquatic plants have been shown to remove efficiently pesticides, lead and pharmaceutical products.

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