Moss that can remove lead from water identified

Funaria hygrometrica is known to grow well in sites contaminated with metals like copper, zinc, and lead. | Photo Credit: Wikimedia commons

Scientists have identified a type of moss that can efficiently absorb a large amount of lead, providing a green alternative for decontaminating polluted water and soil. Lead-contaminated water is a serious environmental concern that has recently proved to be disastrous when left untreated.

Compounding the problem, the typical way to remove lead or other heavy metals from water requires fossil fuels and a tremendous amount of energy. As an alternative to these typical processes, phytoremediation is a method that uses photosynthesising organisms to clean up soil or water contamination.

Researchers from RIKEN Center for Sustainable Resource Science (CSRS) in Japan began their search for a phytoremediation-based removal method by looking at a moss(*Funaria hygrometrica*) that is known to grow well in sites contaminated with metals like copper, zinc, and lead.

“We found that the moss can function as an excellent lead absorbent when in the protonema stage of development,” said Misao Itouga, first author of the study published in the journal *PLOS One*. “This valuable ability means that moss protonema will likely make exceptional wastewater cleaners in mining and chemical industries.”

After 22 hours of exposure to different concentrations of metals, mass-spectrometer analysis showed that the moss cells had absorbed lead up to 74 per cent of their dry weight, which is quite high and much higher than any of the other metals.

Knowing where the lead accumulates is important for understanding how it occurs and for developing the most efficient phytoremediation. Analysis showed that within the moss protonema cells, more that 85 per cent of the lead had accumulated in the cell walls, with smaller amounts being found in organelle membranes and inside the chloroplasts where photosynthesis occurs. This means that there is something special about the cell walls of this species of moss that allows them to thrive in environments that are toxic to other plants.

“We compared *F.hygrometrica* data with those from land plants and seaweeds and found that the presence of polygalacturonic acid in the cell wall is one of the characteristics that separated this type of moss from other plants,” said Itouga.

They next determined that the protonema cells absorbed lead well at pH values between 3 and 9, which is important because the acidity of metal-polluted water can vary.

“Our findings show that *F.hygrometrica* is a useful bio- material for recovering lead from aqueous solutions, and will contribute to the Sustainable Development Goals set by the United Nations, specifically the Life on Land goal,” said Hitoshi Sakakibara, from CSRS.

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