Evaluation of Heavy Metal Bioaccumulation by Native Southwest Missouri Wildflower (Echinacea purpurea)

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Heavy metal pollution caused by activities such as improper disposal of mining waste, ore smelting, and the burning of fossil fuels by automobiles or power plants is especially prevalent in the Southwest Missouri (SWMO) area, which is part of a historical mining district that was a major lead and zinc producer for more than one hundred years. The remediation of these polluted sites is a top priority for the well-being of the environment and human health; one method is phytoremediation, which makes use of pollutant-accumulating plants to improve the conditions of polluted areas. Echinacea purpurea (E. purpurea) is a wildflower native to SWMO and much of North America. This study evaluated the bioaccumulative properties of E. purpurea as a possible phytoremediator by sustaining plants in hydroponic solutions with differing concentrations of pollutants (lead, zinc, and iron) for a period of three weeks, then quantifying the metals in the plant tissues using MP-AES analysis. After treatment, the majority of plants died, likely due to metal toxicity. Bioconcentration factors were all significantly below 1 ($p < 0.0001$), and when compared to an established hyperaccumulator (the common sunflower), E. purpurea accumulated significantly less lead, but significantly more zinc ($p < 0.0001$). These reasons suggest that E. purpurea would be a poor option to use in phytoremediation projects.

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