Using Plants to Remove Heavy Metals From Wastewater

Brannan, Holly (School: Grangeville High School)

I chose this experiment to try to reuse waste from paper mills to make them more environmentally friendly. I discovered the steam from some factories contains trace amounts of ammonia, and the wastewater contains trace amounts of heavy metals. My objectives are to see if plants can pull zinc from water, and how much if they can; as well as to see if some plants work better than others. Once the plants have absorbed as much as possible, they can be mined to retrieve the heavy metals they absorbed. I worked with three plants, chlorella algae, elodea, and lemnoideae, to test their ability to absorb, or phytoremediate zinc in wastewater. I put the plants in tanks and left one tank without plants as the control. The tanks were filled with water that was “polluted” with zinc nitrate. I used titrations to calculate the molarity of the water in the tanks, and will continue to do so. The titrations help determine the amount of zinc the plants have absorbed compared to how much is still in the water. The elodea removed zinc at a statistically significant level according to an ANOVA, the algae was only significant in some post hoc tests. I will also be testing two new plants, hornwort and fanwort, in place of lemnoideae and algae, since the new plants should be less problematic than the originals. I will add nitrifying bacteria to turn the ammonia into nitrates to help the plants grow. After I finish the experimentation, I will do another statistical analysis of the data using an ANOVA. Lemnoideae may not be the best plant for phytoremediation because it died, likely from shock during shipping. Elodea has proved the best at absorbing the zinc with a 30.56 percent decrease of the zinc in the surrounding water. I have yet to finish experimenting and collecting data.

Awards Won: