Reducing Phosphorus in Stormwater Basins Using Algae Spherification

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Phosphorus is a limiting factor for algae blooms and often a problematic non-point pollutant. Stormwater basins are designed to collect urban and agricultural runoff, retain it, and remove pollutants. However, the overflow from stormwater basins often carries a heavy phosphorus load directly into lakes and rivers. In this study, I propose a method using the green algae, Chlorella spp, to consume phosphorus before waters overflow into aquatic ecosystems. I tested a small-scale model of spherized algae that could be suspended in the water column for 1-2 weeks and then retrieved after optimal phosphorus removal. I also designed a large-scale model of floating buoys that could be deployed in a stormwater basin. The Chlorella was spherized by mixing a concentrated algae stock with sodium alginate. This polysaccharide $(C_6H_8O_6)_n$. spontaneously forms spheres when dropped into a 2% calcium chloride solution. The resulting algae spheres were then placed in a mesh pouch and floated in 1000 mL of 2 mg/L sodium phosphate standard. Samples were taken of the standard solution at 24-hour intervals and analyzed for orthophosphorus. It was determined that 150 mL of spherized algae consumed approximately 2 mg of available phosphorus in a 2-week period (13 mg per liter of algae). At this rate, using the proposed large-scale design of six pouches containing 2-liters of spherized algae, each floating buoy would remove approximately 160 mg of phosphorus.

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Third Award of $1,000