Engineering a Completely Biodegradable Water Treatment System To Reverse Eutrophication in Leachate Canals That Lead Into the Indian River

Zrallack, Robert (School: Titusville High School)

What is the most cost-efficient design of a completely biodegradable water treatment system that uses aquatic plants to reduce the amount of eutrophication in leachate canals feeding the Indian River? The researcher noticed that aquatic and sea life has been decreasing due to the toxic algae blooms. He re-engineered the aquaponics system from previous research to meet self-set guidelines: fully biodegradable, cost-effective, able to be produced in mass, and easily deployed. The researcher realized the transportation of aquatic plants requiring water submersion was neither cost-effective nor easily produced in mass. The researcher had to create a way to keep aquatic plants alive without submersion during factory assembly, transportation, and deployment on-site. The researcher tested multiple combinations of spores and rhizomes mixed in various types of medium kept in gelatin capsules for the most viable solution for transportation. Mineral oil showed the best results. Extensive tests were run on the growth of the plants to find the maximum amount of time the capsules could be in transport and still survive. Twenty-four separate eight-week tests were run. The researcher found that all spore tests under both two and three days of transport showed significant growth over the rhizomes. Most tests under 5 days of transport did not survive. He constructed a system that uses a new type of buoy made from excess wood particles, an auto height adjusting shelf for maximum nutrient removal and water oxygenation. This system meets his guidelines and removes nutrients.

Awards Won:
Fourth Award of $500