Sustainable Hydroponic Production Using Automated Agricultural Nutrient Reclamation

Kratcha, Gavin (School: Hankinson Public School)

Agricultural tile drainage, a method of providing drainage for fields, can cause large amounts of nutrients to be leached out of fields. Nutrients can be absorbed into the rainwater, which is then pumped out of the field. These nutrients, when in our waterways, can cause eutrophication, a pressing issue in our environment today. I wanted to find a way to automatically take these nutrients out of the discharged water and use them to aid crop growth. I tested how 8 different water sources affect crop growth. I used Reverse Osmosis (RO) water as my control. I then created a nutrient solution that is ideal for crop growth. I used three strong base anion exchange resins (SBA) to make their respective filtered water sources by filtering the ideal solution through each SBA. I also created three reclaimed water sources by regenerating the SBAs. I tested all eight of these water sources to see their effects on the growth of Lettuce, Kale, Arugula, and Collards for a month in both hydroponic and soil growing environments. I tested Shoot Length, Root Length, Wet Mass, Dry Mass, and Chlorophyll at the end of their growth. I also created an automatic filtration system to do this process automatically. I found that creating a system that could automatically filter and reclaim nutrients from agricultural drainage water is feasible. I also found that reclaimed nutrients could be used in hydroponic to grow crops without supplementing large amounts of fertilizer, leading to potentially higher profits.

Awards Won:

Second Award of $2,000