Experimental Investigation of Phytodesalination and Growth Rate of Duckweed (Lemna minor) in Salt Water Hydroponics and Developing a Generalized Linear Model for Desalination

Patel, Swara (School: Carrollwood Day School)

Less than 1% of the Earth's water, a nonrenewable resource is accessible as fresh water to us. Global warming, industrialization and exponential growing human population is exacerbating food and freshwater shortage. Exploring the potential of duckweed as a phytodesalinating agent for salt water would alleviate both the issues and serve as a model for a better environment. Purpose: This investigation aims at growing duckweed hydroponically in different saline solutions (SS) to test its desalination potential. Procedure: In this investigation, 0.63 g Duckweed (¼ tsp) was grown in a commercial hydroponic nutrient solution (HS) as a control, distilled water, a 1%, 2%, and 3% salinity increased solution. Electrical conductivity (EC) and pH were measured every 3 days over a period of 30 days. Spectrum grow lights were set on a 16/8 hour cycle. Data: The average decrease of EC for SS, 1% (826 µS/cm), 2% (677 µS/cm) and 3% (608 µS/cm), indicated that duckweed desalinated all solutions. Experimental data fit the trend line of a generalized linear model. Phytodesalination rate change (PRC) was calculated to see the date at which desalination was most effective for each saline solution. A paired t-test was conducted to validate the significance of the data, comparing the desalination rate of SS to HS. Fresh weight of duckweed increased in 1% and 2% SS, but decreased in 3% SS. This research underscores duckweed as a sustainable solution to alleviate water scarcity and food insecurity amidst a warming climate.