Creating bioplastics from duckweed

Overview

Using duckweed, a second-generation aquatic species, to produce a more sustainable and scaleable polylactide bioplastic that offers the opportunity for increased crop yield and reduced cost.

Problem

The sugars used to make bioplastics are often made from crops like corn and sugar cane which consume land out of production needed to feed a rapidly increasing population. 1 kg of PLA requires 2.65 kg of corn, and if the quantity of plastic produced every year came from corn-based sources, that would be over 715 million tonnes.

The Solution

Duckweed is an aquatic species that humans do not consume, thus eliminating the problems of decreasing food supply and the usage of farmable land. Duckweed can double its biomass in as little as 16 hours, is the smallest flowering plant known to Earth and grows on every continent except Antarctica, making it ideal for a material like plastic.

Advantages

A duckweed-based bioplastic would enable a material that doesn't use fossil fuels or crops that humans consume. A by-product of protein could be sold and the duckweed would sequester carbon dioxide and remove mineral contaminants when grown in wastewater, thereby helping to play a role in combatting climate change. 1.4 million pounds of duckweed per hectare annually can be produced, which is 50 times more than what is derived from corn.

The Opportunity for Duckweed



Abundance & Growing Time

Duckweed can spread very easily, usually through water channels, and once they find stagnant water they can proliferate so rapidly that they can cover an acre of surface in only a month and a half.



Harvesting the Biomass

Cultivating a biomass like algae is very expensive due to the consumption of labor and water. There's also the energy needed to circulate gases in photobioreactors. Duckweed can be harvested with a pool skimmer!

Vertical Farming

Duckweed is an ideal feedstock for vertical farming. Duckweed does not require farmable land to grow, so hydroponics can be utilized, where crops are grown in water instead of soil.



More starch than corn per unit area generated



Starch content can be reached by duckweed



Contaminant removal efficiency of duckweed

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