CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
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Project Number
38469

Project Title
AlgalPlast: Sustainable Bioplastic from Algae and Its Effect on Tensile Strength, Water Permeability, and Compostability

Abstract

Objectives/Goals
In spite of many benefits that plastics offer, negative impact has become a global problem that is affecting us economically and environmentally. Only 25% of plastic is recycled and rest ends up in landfills and ocean, contributing to environmental and aquatic pollution. Plastics take hundreds of years to degrade, in turn increasing global warming. In near future, there is an inevitable need for sustainable, low-cost, bio-based sources in the plastic industry. Marine algae are the fastest growing plants on earth and produce a variety of base materials such as starches, proteins, and oils that can be used for bioplastics production. Goal of my project is to compare the efficacy of bioplastics made from various algae types to determine if they are viable alternatives to petroleum-based plastic.

Methods/Materials
Part1:
Bioplastic was made from 3 algae types - Chlorella Vulgaris, Sprirulina Maxima, and Rhodophyta (Red Algae). Procedure to make the bioplastic involved key materials such as types of algae powder, glycerol, and water, applying heat, and molding to desired sheet form.
Part2:
Testing was performed to evaluate the efficacy of bioplastics made from the 3 types of algae. This was achieved through Tensile Strength test, Water Impermeability test, and Compostability test with petroleum-based plastic as the control.

Results
Bioplastics produced from algae types were compared based on ability to endure weight, resistance to water permeation, and disintegration in composting environment.
Results indicated that among bioplastics tested, Chlorella showed highest tensile strength, good resistance to water permeation, and highest compostability rate. Spirulina performed second best, followed by Red Algae as third.

Conclusions/Discussion
Performance of bioplastic from Chlorella Vulgaris was the most effective among algae types tested. One area where algae-based bioplastic was not as effective as petroleum-based plastic was in tensile strength. All bioplastics proved to be compostable - a significant advantage over petroleum-based plastic.
This project demonstrates that algae-based bioplastic is a sustainable and viable alternative to conventional plastic, which can help reduce environmental pollution and our dependency on non-renewable resources.

Summary Statement
I created a bioplastic from algae that is a viable, sustainable alternative to petroleum based plastic.

Help Received
My science teacher offered guidance and support through review and feedback