Engineering of Antimicrobial Bioplastics From Invasive Algae Caulerpa prolifera, Undaria pinnatifida, and Waste Corn Cobs

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Are biodegradable plastics in the market truly biodegradable? Current biodegradable plastics such as PLA and oxo-biodegradables are found to be inefficient for they require a special composting facility which most individual do not have access. To solve this problem, this project sought to produce a bioplastic using invasive algae and waste corn cobs. The novel bioplastic was created by combining the starch extracted from corn cobs, sodium alginate from Undaria pinnatifida and herbal extracts using ethanol extraction and rotary evaporation processes. The novel bioplastics were then tested, and their strength, melting point, and antimicrobial properties were compared to oxo-biodegradable samples. The results showed that the novel bioplastic was the most efficient. The bioplastic showed 89.94% biodegradation rate after 2 weeks as compared to almost no change in the oxo-biodegradable plastic. In terms of antimicrobial results, all the novel bioplastics showed significant effects against E. coli with garlic having the highest zones of inhibition of 25.28mm. Lastly in terms of strength, the novel bioplastic is as almost strong as commercial plastics. The results showed that the novel bioplastic is more environmentally friendly and cost effective than the other plastics. I was also able to utilize invasive algae which are detrimental to ecological balance, and waste corn cobs that have been a waste disposal problem by a lot of American farmers. Thus, finding a solution to several environmental problems that our planet is facing.

Awards Won:

University of Arizona: Renewal Tuition Scholarship