



# CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

<b>Name(s)</b> <b>Diya Kadadi</b>	<b>Project Number</b> <b>J1310</b>
<b>Project Title</b> <b>Bioplastics from Biowaste: Using Plant Cellulose and Starch to Create Affordable and Durable Plastic Solutions</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives</b> Petroleum based plastics, the ones most commonly used today, pose a huge threat to the environment, filling up nearly all of the world's landfills. This form of pollution can endanger wild species and cannot be decomposed. The materials that we throw away every day, biowaste, can be used to create plastics. Potato peels, banana peels, and corn husks contain natural polymers including starch and cellulose which can help create affordable and durable solutions to end the plastic crisis. The objective of this experiment was to test the tensile strength, water resistance, and biodegradability of bioplastics using biowaste. It was hypothesized that if the type of biowaste used is potato peels, then the plastic will have the greatest tensility. All plastics will be water resistant and biodegradable.</p> <p><b>Methods</b> To make the bioplastic, the extracted starch and cellulose from each biowaste was combined with glycerin, water, and vinegar over a heat source. The plastic was then baked to stabilize the polymers. The different types of biowaste were the independent variables and the dependent variables were the plastics' effectiveness measured in tensility, water resistance, and biodegradability. A spring scale was used to test the tensile strength, and water was poured in increments on the bioplastic to test for water resistance. The bioplastics were then composted to be broken down by decomposers. Petroleum based plastics were used as the control group.</p> <p><b>Results</b> The results showed that banana peels created the bioplastic with the greatest tensile strength of 3.706 Newtons per cm<sup>2</sup> because of its combined starch, cellulose, and fibers. Corn husks came in second with a tensile strength of 1.806 Newtons per cm<sup>2</sup> and potato peels came in last with an average tensile strength of 1.396 Newtons per cm<sup>2</sup>. All bioplastics were water-resistant and biodegradable.</p> <p><b>Conclusions</b> The hypotheses were partially supported, as all the plastics were water resistant and biodegradable but banana peels proved to have the greatest tensile strength. This was most likely because potato skins contain much starch but not as much cellulose as banana, which has about 65% cellulose. The results of this experiment suggest that bioplastics made from banana peels to form brittle plastics can be very effective and can replace petroleum based plastics. The world can be spared from the negative consequences of plastic pollution through the use and production of feasible, environmentally-friendly, and effective bioplastics made from biowaste.</p>	
<b>Summary Statement</b> I created affordable bioplastics using potato peels, banana peels, and corn husks and tested their tensile strength, water resistance, and biodegradability.	
<b>Help Received</b> My science teacher guided me and provided feedback throughout the project.	