



**CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY**

Name(s) Charlotte Y. Kim	Project Number S0617
Project Title The Fantastic Bioplastic! An Investigation of the Relationship Between Bioplastic Composition and Tensile Strength	
Abstract Objectives/Goals This project was designed to determine how varying the amount of a specific ingredient that constitute a bioplastic mixture can affect tensile strength. I hypothesized that if more glycerin is added to a mixture of cornstarch, water, vinegar, and glycerin, then a bioplastic with increased tensile strength and flexibility will be produced. Methods/Materials Mold, 40 bioplastics made of cornstarch, water, vinegar, and varying amounts of glycerin, stove to heat the bioplastics for 3 minutes and 3 seconds, testing apparatus to test the bioplastic's tensile strength and deformation, rocks, basket, caliper, foodscale, fishscale, ruler, stopwatch, room temperature room for bioplastics to dry in for 10 days. Measured how bioplastics with varying amounts of glycerin can withstand force and its ability stretch. Results The bioplastic with 1 tsp of glycerin was used as a control. The other bioplastics had increased amounts of glycerin by 1/2 tsp each test trial from that of the control until a total of 3 tsp of glycerin was tested. Each bioplastic had 8 test samples therefore 40 tests in total were ran. The bioplastics used as a control (1tsp) withstood more weight compared to the plastic with 3tsp. Conclusions/Discussion Overall, test data do not support the hypothesis. When more glycerin was added to the bioplastic mixture, tensile strength was significantly reduced. The bioplastic mixture with only 1 tsp of glycerin that was used as a control held 149 psi more stress than the bioplastic mixture with 1½ tsp of glycerin. This showed how much of a difference a small amount of glycerin can affect the bioplastic's properties like tensile strength. Flexibility was also significantly reduced as the amount of glycerin was increased; however, this result could be an indirect result of the bioplastic being weaker and failing under less load. This is because glycerin is a plasticizer. It traps water in the starch chains making the polymer chain molecules bend and slide past each other more easily, which adds to the flexibility of the plastic.	
Summary Statement I showed that bioplastics with increased amounts of glycerin withstand less force compared to a bioplastic with a lesser amount of glycerin.	
Help Received I received help from Sam Kim (my Father) in building and designing the test apparatus.	