Testing the Tensile Strength of Student Engineered Starch-Based Bioplastic

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Due to the manufacturing of single-use plastic on the rise, we made it our goal to find a safer, bioplastic substitute, to lessen plastic's negative impacts on the environment. After two years of trial and error, the student-engineered bioplastic showed promise as a plastic alternative. In order to find a viable application, the tensile strength of bioplastic samples, containing varying levels of glycerol, was tested to determine which formula most closely resembles that of common single-use plastics. After several casting failures, consistent samples were successfully created by spreading a thin one-millimeter layer of the bioplastic solution onto a silicone mat, producing a plastic sheet. The six bioplastic sheets were cut to the specified shape and sent to the 3D Systems lab for tensile strength testing. The results revealed no clear relationship between altering the percent glycerol by weight and the sample's tensile strength (MPa), percent elongation at break, or Young's modulus (GPa). However, further testing is required to better understand their relationship. After analysis, it was found that all samples were most similar to polystyrene plastics which are commonly used in food packaging and labware. Furthermore, the bioplastic samples containing 15% glycerol by weight produced the most consistent results and had a much higher tensile strength and percent elongation at break than the other samples.