Engineering a Bioplastic With Aspergillus oryzae To Increase Degradation Rate

Armstrong, Anna (School: Joel E. Ferris High School)

Current plant-starch plastic products take 3-6 months to decompose, making them a great alternative for traditional plastics. With increased usage of these plastic alternatives comes increased disposal of them. These bioplastics are often taken to landfills and anaerobic environments. Once here, decomposition is not possible. The purpose of this project was to increase the decomposition time of plant starch-based plastic alternatives to maximize the decomposition of bioplastics before their life cycle comes to a halt in anaerobic waste facilities by incorporating Aspergillus oryzae spores into the bioplastic. A mixture of arrowroot starch, distilled white vinegar, vegetable glycerin, water, and A. oryzae spores were heated and formed into sheets or molds of bioplastic and left to dry in an incubator for several days. A control group sample was comprised of the same mixture without the spores. Samples of both bioplastics were placed into respective compost bins after being massed and were left to decompose for one week. Though the control group didn't appear any different after one week in the compost bins, the experimental plastics had perforations and a noticeable change in mass. An unpaired t-test showed very statistically significant evidence that the experimental group decomposed at an accelerated rate. The mean change in mass of bioplastics of the experimental group more than doubled the change in mass of the experimental group. Given these results, we must reject the null hypothesis. By incorporating A. oryzae in bioplastics, decomposition time can be cut in half.

Awards Won:
Fourth Award of $500