



CALIFORNIA STATE SCIENCE FAIR

2015 PROJECT SUMMARY

Name(s) Kaitlyn A. Arst	Project Number S1003
Project Title Using Starch and Biopolymer Aqueous Solutions to Reduce Soil Erosion	
<div><div>Objectives/Goals<p>The purpose of this study was to determine whether Corn Starch, Wheat Starch and Potato Starch each mixed into a solution with biodegradable biopolymers Xanthan Gum and Beta-1,3/1,6 Glucan could be used to strengthen the soil to make it more erosion resistant than untreated soil. If so, which soil amendment solution is most effective in controlling soil erosion? This research is divided into two phases. Phase one is a rain simulation test. Phase two is a plant germination test.</p></div><div>Abstract</div><div>Methods/Materials<p>Soil was divided into 4 containers. Corn starch (CBX), Wheat starch (WBX) and Potato starch (PBX) each mixed into 3 individual aqueous solutions with Beta-1,3/1,6 glucan, Xanthan Gum and distilled water were applied into the soil of its respective container. One container, as the control had no added amendments to the soil. 5,350 mL of water was applied every other day for 2 weeks onto each soil container. After each cycle of rain, runoff soil was collected from each container, sieved, dried and weighed. The soil content of nitrogen, phosphorous, potash, and pH balance levels were tested. After 2 weeks, 50 seeds of Pisum sativum var. macrocarpon were planted into each container to test soil quality.</p></div><div>Results<p>Soil treated with the wheat starch mixed with Beta-1,3/1,6-glucan and Xanthan gum solution was the most effective in controlling soil erosion with a 1.4 grams average soil run off. While the non-treated soil had the most soil run off with an average of 193 grams of soil seeping through. The control plant also had the lowest germination rate after 7 days with 0% growth while the wheat starch mixed with Beta-1,3/1,6-glucan and Xanthan gum had a germination growth rate of 42%. The pH balance tests of the soil ranged from 7.0 (neutral) to 7.5 alkaline. The N, P and K tests ranged from depleted to surplus.</p></div><div>Conclusions/Discussion<p>The results showed the wheat starch mixed with Beta-1,3/1,6-glucan and Xanthan gum Biopolymer treatment remained stable against soil erosion and indicated this amendment can be used as an eco-friendly alternative for effective treatment of soil erosion. CBX would be next alternative compared to PBX which would be the least effective due to higher amount of soil runoff and lowest seed germination when compared to the WBX and CBX. The soil control did not perform well when compared to the WBX, CBX and PBX soil amendments.</p></div></div>	
Summary Statement <p>In this study, a novel environmentally friendly soil treatment was developed, using starch and biopolymer aqueous solutions to reduce soil erosion.</p>	
Help Received <p>My parents helped with buying materials and guiding me with safety precautions</p>	