



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Shreya Ramachandran	Project Number J2115
Project Title Effect of Soap Nut Grey Water on the Environment (Soil and Plants)	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals As many parts of the world are experiencing water scarcity, there is a growing interest for reusing greywater from the laundry. Since many commercial laundry detergents contain harmful chemicals, I wanted to test if greywater from soap nuts, a natural laundry detergent derived from the Indian soap berry, could be used as irrigation water, without harming the environment. This is a continuation project where in last year I tested the effect of soapnut greywater on aquatic life and this year I am testing it on soil and plants.</p> <p>Methods/Materials To conduct my experiment I grew one type of plant species, tall fescue grass. I had 6 replicates for each grey water treatment (soap nuts, organic detergent, non-organic detergent and regular water) for a total of 24 replicates. The experiment was repeated for two types of soil, leading to a total of 48 replicates. The plants were watered every 3-4 days in a controlled environment for a period of 6 weeks. I tested the effect of the greywaters on soil health by comparing soil macro and micro nutrients, pH, CEC and EC. Plant health was evaluated by recording the plant height, the final biomass, visual health and by measuring nutrient levels in the plant tissues. The greywater and leachate (200+ samples) was tested for pH, EC, TDS and TOC.</p> <p>Results I analyzed my data using ANOVA ($P < 0.05$) followed by post-hoc comparisons where necessary. My results showed that Soapnut was not detrimental to plant growth with a trend for higher plant height and plant biomass than for regular water and the other greywaters. The soil constituents of interest with respect to greywater are boron, pH, and salinity. For all of the soil and plant nutrients tested, including these, the soapnut greywater did as well as regular water. However, the non-organic detergent led to boron toxicity issues. The soil and leachate analysis indicated high levels of salts and heavy metals such as Cu, Pb, Mn and Zn in the non-organic detergent's sandy soil. This led to the non-organic detergent's plant death at the end of 5 weeks.</p> <p>Conclusions/Discussion After the two year study I now conclude that soapnut greywater does not significantly affect the environment, and can be used for irrigation. Also, the cost of using soap nuts for 50 loads is only \$5.65 which makes soap nuts and its greywater not only a solution for California's historic drought, but also to the global water crisis.</p>	
Summary Statement This project looks at the effects of greywater from soapnuts (a berry shell that naturally produces soap) on the environment especially soil and plants when compared to other detergents and regular water.	
Help Received I conducted part of my experimentation using U.C. Berkeley's lab equipment under the supervision of Mrs. Celine Pallud.	