



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Pranav Moudgalya	Project Number S1113
Project Title Assessment of Organic Waste Materials in Nitrate Filtration of Southern California Waters	
<p style="text-align: center;">Abstract</p> <p>Objectives The purpose of this study was to evaluate the use of fruit peels as a novel & natural bio-adsorbent to remove nitrates from water.</p> <p>Methods The experiment(s) involved using fruit peels, dehydrated and crushed into a fine powder, as a treatment for various water sources (Woodbridge Lake, Heritage Lake, Distilled Water, and a KN03 Solution). Baseline nitrate measurements for each water source were taken via the use of a Vernier Nitrate Selective Electrode. Every water source was tested in 100mL batches. For every 100mL of water being tested, 0.05g of each fruit peel was added into the water and underwent a 30-minute agitation process (250 rpm on a magnetic stirring plate). After the mixing of the treatment with the water sources, the solution was filtered using a coffee filter/cheesecloth apparatus and the remaining liquid was measured for nitrate concentration. For every water source/fruit peel combination, three trials were conducted.</p> <p>Results Results partially supported the hypothesis. In the control samples (distilled water), the nitrate concentration of the water went from a pre-treatment level of 0.51 mg/L down to 0.15mg/L in the lemon peel treatment, 0.08 mg/L in the orange peel treatment, and 0.27 mg/L in the banana peel treatment. A two way ANOVA was used to verify statistical significance between means. A post-hoc Tukey HSD test confirmed significance of every fruit peel tested against the means of all other groups ($P < 0.01$). In the Heritage Park and Woodbridge Lake samples, a two-way ANOVA suggested that the introduction of the fruit peel treatments, on net, increased in the nitrate concentration of the sources ($P < 0.01$). Finally, in the experiment involving the KNO3 solution, the analysis performed via a two-way ANOVA indicated no significant correlation between treatment groups and either an increase/decrease in nitrate concentration ($P < 0.01$).</p> <p>Conclusions This study indicates that in samples of distilled water, the introduction of fruit peels as a treatment decreases the nitrate concentration of the water. In the distilled water samples, the most efficacious treatment group was the orange peels, decreasing the nitrate concentration by up to 84%. However, in the field water samples, the introduction of the treatment significantly increased the nitrate concentrations of the water sources, with no discernable hierarchy between the results of different treatment groups. More research is necessary to understand why results found in the distilled water samples are not consistent among all water groups.</p>	
Summary Statement In this study, fruit peels were assessed as being potentially effective bioremediants of nitrates in select water sources.	
Help Received The design, execution, and analysis of my project was done completely independently. My parents supported me morally and financially, driving me around to collect water samples and buy materials. In addition, Claudia Weihe of the UCI Martiny Lab assisted me with advice on good research practices.	