



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

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Project Title Extraction of Bio-Ethanol from Wasted Bio-Wastes through the Process of Fermentation and Distillation	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The main objective of the experiment was to observe if the common household wastes, such as apple and banana peelings, were suitable to be used as another source of producing bio-ethanol. The experiment also served as a way to relieve the world's dependency on oil and fossil fuels through the extraction of bio-ethanol from the wasted bio-wastes. Through this experiment, people will discover that energy can be derived from even wastes that are thought to be just useless.</p> <p>Methods/Materials During the experiment, the peelings of apple and banana were mixed with water and yeast to start the fermentation.(24 hour and 48 hour) From the fermentation process, the bio-ethanol was produced from both the apple and banana. The produced mixture then went through the distillation process, where the ethanol was boiled out at 78.4°C, to extract the ethanol out of the mixture. After the extraction of the ethanol, the amount of ethanol production was measured. The variables that were altered for the test of the hypothesis were the amount of bio-waste (peelings)and duration of fermentation (24 & 48 hour). The sample size of the banana peelings was 8. The sample size of the apple peelings was 8. Total of 16 samples. 8 trials were observed for both apple and banana peelings. The measurement for amount of bio-waste was in grams and the amount of ethanol was measured in milliliters.</p> <p>The materials used during the experiment were banana peelings, apple peelings, water, yeast, condenser & still head/receiver/pot (Distillation System), sand bath/stirrer plate, and electric balance.</p> <p>Results The average mean of bio-ethanol produced from banana was 6.65 mL and the average mean that apple produced was 5.57 mL. Also the mean of ethanol production during the 24 hour fermentation period (both apple and banana) was 5.15 mL, and the mean of ethanol production during the 48 hour was 6.8 mL.</p> <p>Conclusions/Discussion As a result, the hypothesis of the experiment that banana peelings would produce more ethanol than the apple peelings was supported. The result also showed that both the banana and apple peelings can be used for the production of ethanol. The data supported that the amount of bio-ethanol produced from banana peelings was greater than the amount produced by the apple peelings.</p>	
Summary Statement Demonstrating the importance of wasted bio-wastes through the production of bio-ethanol, an alternate fuel source that is more energy-efficient and eco-friendly than the fossil fuel that is used today.	
Help Received Used laboratory equipments at University of California Irvine under the supervision of Dr. Yoon Kim.	