



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

Name(s) Rithik Jain	Project Number J0613
Project Title Bang for Your Buck: The Effect of the Type of Fuel on Energy Content	
<div>Objectives/Goals<p>Dirtier, nonrenewable fuels, like diesel and gasoline, seem to be used much more extensively than the cleaner burning and renewable fuels, like biodiesel and ethanol. This experiment was designed to determine whether gasoline and diesel really have the best advantages in terms of energy content. The question was asked, which common automotive fuel, diesel, gasoline, biodiesel, or ethanol, has the most energy content? The hypothesis was formulated that diesel would have the highest energy content.</p></div> <div>Abstract<p>Since 100% pure biodiesel was not available commercially, it was produced at home using canola oil. 1.5 grams of potassium hydroxide (KOH) was mixed with methanol. The resulting solution was poured into 200 mL of canola oil. After agitating the solution, it was allowed to sit for 24 hours in order for the glycerin to separate out from the pure biodiesel. To compare and measure the relative energy content of all four fuels, calorimetry was performed. Each of the four hydrocarbons was burned in an alcohol burner under 500mL of water in a covered beaker. The temperature increase of the water and the weight reduction of the fuel were measured. This procedure was repeated 5 times for each fuel, and the average energy transfer in calories per gram for each type of fuel was calculated and recorded.</p></div> <div>Methods/Materials<p>Since 100% pure biodiesel was not available commercially, it was produced at home using canola oil. 1.5 grams of potassium hydroxide (KOH) was mixed with methanol. The resulting solution was poured into 200 mL of canola oil. After agitating the solution, it was allowed to sit for 24 hours in order for the glycerin to separate out from the pure biodiesel. To compare and measure the relative energy content of all four fuels, calorimetry was performed. Each of the four hydrocarbons was burned in an alcohol burner under 500mL of water in a covered beaker. The temperature increase of the water and the weight reduction of the fuel were measured. This procedure was repeated 5 times for each fuel, and the average energy transfer in calories per gram for each type of fuel was calculated and recorded.</p></div> <div>Results<p>After the data was analyzed and the average calories per gram transferred from each fuel was found, it was determined that diesel had the highest energy content that could be released through combustion. Diesel had an average of 3300 calories per gram. It was followed by biodiesel with 3000, gasoline with 2700, and ethanol with the lowest of 2300 calories per gram.</p></div> <div>Conclusions/Discussion<p>The results from the experiment proved the hypothesis correct. Surprisingly, biodiesel contained more energy than gasoline, a much more commonly used fuel, and only 10% less than diesel. Even though diesel had the highest energy content, the amount of soot produced during the experiment makes biodiesel a better option. Along with the minor difference in energy content, biodiesel also has other advantages, such as the fact that it is clean burning and renewable, unlike both diesel and gasoline. Therefore, biodiesel seems like the best fuel overall, having a high energy content and better impact on the environment.</p></div>	
Summary Statement <p>The purpose of this project is to test which common automotive fuel, diesel, biodiesel, gasoline, or ethanol, has the highest energy content.</p>	
Help Received <p>I would like to thank my father for supervising potentially dangerous parts of my experiment and my teacher Mrs. Nguyen for her mentorship.</p>	