



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

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Project Title Biodiesel Burn-Off: Using Calorimetry to Compare Various Biodiesel Fuels to Commercial Diesel	
Objectives/Goals Purpose: To determine if Biodiesel made from vegetable oil/animal fat is an effective fuel by burning the oil, heating water, and measuring how much water temperature is raised. Problem: Which is best biodiesel from oil or fat, or commercial diesel. Background: Biodiesel is a diesel equivalent fuel made from animal fat or vegetable oil and is non-toxic and biodegradable with fewer emissions. The process to make Biodiesel is called transesterification. The simplified process is: A triglyceride reacts with Methanol (CH ₃ OH) to yield fatty esters with three R's and Glycerol.	
Abstract	
Methods/Materials Materials: Animal fat/vegetable oil, Methanol, Lye, 2L Plastic soda bottle, Balance, Glass, Mixing vessel, Tin can, Fire resistant dish to burn fuel, Temp Probe, Commercial Diesel, Water Procedure: 1. Heat waste oil/fat to 120°C to remove water and heat until spitting and popping stops. 2. Heat new oil to 55°C. 3. Cool oil to 60°C. 4. Mix 250mL. Methanol and 4g NaOH for new oil, 6-7g for used oil in a well-ventilated area until lye dissolves. 5. Add methanol to achieve 250 ml. 6. Pour oil and Methoxide into 2L soda bottle, seal and shake for ten seconds. 7. Wait 1-2 hours. Biodiesel will be top layer; glycerin will be bottom layer. To test the heat capacity of oil produced. 1. Place 10g fuel in a dish under a tin can with 50ml of water in it. 2. Record the starting temperature of the water. 3. Burn the entire fuel sample. 4. Record the highest temperature the water reaches. 5. For a control burn 10g of commercial Diesel. 6. Using the equation $E = (S)(m)(DT)$, where S is the specific heat capacity of water (4.18 joules per A°C), m is the mass of water, and DT is the change in heat, calculate the amount of energy produced.	
Conclusions/Discussion Conclusion: The fuel made from peanut oil produced the most energy. From these results it is the best candidate for biodiesel. Discussion: The experiment set up was a fairly simple, but it was difficult to achieve good results at home. Many conditions could not be controlled. It was difficult to create a dish to burn the fuel. A ceramic dish cracked. I finally used a tinfoil boat but it took two tries to make one that didn't leak. I had a problem lighting the fuel but I found a way to do it with a propane torch. My findings were that a homemade diesel fuel yielded more energy per gram, and produced far less smoke and particulates than commercial diesel.	
Summary Statement Comparing home made diesel fuels to commercial diesel.	
Help Received Mother provided lab materials	