



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Richard Hsiao; James Ma; Sara Thoi	Project Number 22606
Project Title Can Biodiesel be a Viable Substitute to Standard Diesel Fuel?	
Abstract Objectives/Goals The objective of this project is to produce and analyze biodiesel, an alternative fuel created from vegetable oil. The study of biodiesel involves comparative analysis with standard diesel to determine its viability as a substitute. Current research and data indicates that biodiesel is the viable substitute to petroleum-based diesel that we hypothesized. Methods/Materials Lye, methanol, and soybean oil are blended in a household blender for 15 minutes and are allowed to settled overnight. The byproduct, glycerin, settles from the heterogeneous solution and density tests are performed by a mass to volume comparison and a hydrometer. Samples are tested using Fourier Transmittance Infrared Spectroscopy (FTIR), which indicates the uniformity of bonding peaks. Lubricity and flammability tests are also performed and qualitative observations are recorded. Emission testing is done at the Universal Technical Institute. Results The FTIR results show that in each of the 15 batches, the same preponderance of bonding occurs that indicates the presence of alkanes, carboxyl groups, and esters leading to the belief that the desired methyl-ester product is being created. The average density of the biodiesel produced is 0.8889 g/mL. Flammability is comparable to that of national diesel and California reformulated diesel. Lastly, lubricity is similar to national diesel and shows significant benefits over California reformulated diesel. Conclusions/Discussion It is concluded in the FTIR results and density tests that biodiesel is being consistently produced. Based on emission research, biodiesel appears to be less environmentally harmful than California reformulated diesel. The research seems to imply that biodiesel is both environmentally and economically feasible.	
Summary Statement This project is focused on producing biodiesel and analyzing whether it is a viable substitute to standard diesel	
Help Received Used lab equipment at Innovative Organics under the supervision of Doug Ward; Emissions testing was done at the Universal Technical Institute; Marla Ward was the chemical advisor; Michael Winters was the construction advisor; Ian Watson provided a blueprint for the skid	