



CALIFORNIA STATE SCIENCE FAIR 2005 PROJECT SUMMARY

Name(s) Leslie J. Koyama	Project Number J1521
Project Title 181.4°C in the Sun! Factors that Affect Solar Oven Efficiency	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals I investigated: 1.) How different insulations affect the temperature within a solar oven; 2.) How the cooking vessel to heat absorber plate contact affects the temperature in the cooking vessel. Based on literature research, my hypothesis was that worst to best oven insulation would be: air; shredded newspaper; shredded newspaper + Al foil baffle; shredded newspaper + Al foil baffle + Styrofoam. My hypothesis for the cooking vessel contact experiment was that the better the contact between the vessel and the heat absorber plate the higher the temperature in the vessel.</p> <p>Methods/Materials Four (4) identical solar ovens were constructed out of cardboard, and Al foil, with tempered glass used in the oven lids, and Al heat absorber plates. The insulation and cooking vessel experiments were first performed using a 250-watt heat lamp as the energy source. The insulation experiments were later repeated using the sun as the energy source (4 ovens at same time). Thermocouples were used to monitor the oven temperatures so accurate temperature versus time data could be gathered for plotting.</p> <p>Results The Insulation Experiment: The solar oven with no insulation (air) had the lowest efficiency, and the oven insulated with a combination of shredded newspaper + Al foil baffle + Styrofoam had the highest efficiency (181.4°C in the sun). The oven insulated with shredded newspaper alone had a higher efficiency than the oven insulated with a combination of shredded newspaper + Al foil baffle. The Cooking Vessel Contact Experiment: For all cooking vessel contact conditions, the temperature inside the vessel was about the same (2°C to 2.4°C higher than the absorber plate temperature). In addition, the rate of rise of temperature inside the vessels was the same for all conditions investigated.</p> <p>Conclusions/Discussion The Insulation Experiment: My hypothesis was correct that the oven with no insulation would have the lowest temperature, and the oven insulated with the combination of shredded newspaper + Al foil baffle + Styrofoam would achieve the highest temperature independent of the energy source. But my hypothesis that adding an Al foil baffle would increase the insulation efficiency of shredded newspaper was incorrect. The Cooking Vessel Contact Experiment: The experiment did not support my hypothesis that the better contact between the vessel and the heat absorber plate the higher the temperatures in the vessel.</p>	
Summary Statement The main objectives of this experiment were to investigate how different solar oven insulations and cooking vessel contact affects solar oven efficiency.	
Help Received My Mom secured the thermocouples, thermocouple meter, and helped gather data. My Dad secured materials for building the ovens, supervised the building of the ovens, and assisted with data collection. My teacher, Ms. Robinson, for encouragement and suggestions for my board.	