



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

Name(s) Lianna M. Daug	Project Number J0603
Project Title When the Lime is Right: A Study on the Use of Calcium Hydroxide (Lime) in Ethanol Production	
Abstract Objectives/Goals Agricultural wastes high in cellulose can be used in ethanol production but pretreating these materials can be costly and challenging. The objective of this project is to determine if lime, an inexpensive alkali, can be used to pretreat corn husks for ethanol production. It seeks to find out the optimal conditions, in terms of lime concentration, soak time, and temperature, that will result in the highest sugar and theoretical ethanol yield. Methods/Materials Corn husks were blended, poured in 8 jars, and allowed to soak with different lime concentrations (no lime for Control, low dose LD, medium dose MD, and high dose HD). Sugar content was measured using a refractometer every hour from 0 to 8 hours. After determining optimal dose and soak time, the experiment was repeated putting the jars in a water bath to compare room temperature, medium temperature (50-55°C), and high temperature(60-65°C). Results The average % rise in sugar content after 8 hours at room temperature was highest for HD at 70%, followed by MD at 67.21%, LD at 50%, then Control at 3.92%. Although HD performed the best, it was only marginally better than MD so I determined that the most cost effective dose was MD. Maximum sugar content was reached for all setups at 5 hours. The medium temperature was the best with a rise in sugar content of 105.88% after 5 hours, compared to 98.07% for high temperature and 67.21% for room temperature. Conclusions/Discussion This project shows that lime, a readily available, easily handled, and inexpensive alkali, can be used in the pretreatment of high cellulosic materials such as corn husks for ethanol production. The optimal pretreatment conditions were determined to be 0.3g lime/g corn husks (MD), 5 hours soak time, and medium temperature (50-55°C).	
Summary Statement This project is about determining if lime can be used to pretreat high cellulosic agricultural waste products for ethanol production and to find out the optimal conditions in terms of lime concentration, soak time and temperature.	
Help Received Dr. Felizarta provided the refractometer; Parents helped gather materials.	