



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Jennifer H. Phan	Project Number S0529
Project Title Shedding Light on Proteins: The Effect of Scattered Light on Protease Activity	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this study is to measure the decrease in protease content of fruit juice after being heated.</p> <p>Methods/Materials A turbidity meter was constructed and used to measure the content of protease in a variety of three selected fruit juices as measured by the reduction in turbidity of diluted milk when fruit juices are added to the milk. Used different colored laser lights to shine through each jar containing either 5 ml of inactive (heated) or active (unheated) fruit juice and 150 ml of 10% milk.</p> <p>Results At 2 minute intervals for 20 minutes per trial, the kiwi trials had the greatest voltage for both the inactive and active proteases for all 3 of the lasers and for all 3 fruits, the average voltage for the inactive and active proteases of the blue laser was the highest. The voltages for all three fruits have similar indirect relationships in which they decrease as the wavelength for each laser color increases.</p> <p>Conclusions/Discussion The blue light transmitted through kiwi juice exhibited the highest average voltage for both the inactive and active proteases indicating that protease activity occurs the most under these conditions. The blue (450 nm) laser light has the greatest change in scattered light followed by the green (530 nm), and then the red (700 nm) which shows that in scattered light, the shorter wavelengths predominate. The percent change in voltage of the active proteases is greater than the inactive proteases while the average voltage of the inactive proteases is higher than the active proteases which means that throughout each of the 20 minute trials, the voltage for the inactive proteases were relatively constant while the voltage of the active proteases were slowly decreasing. When the protease activity increases it causes the proteins in milk to coagulate and makes the milk less turbid. This demonstrates that when fruit juices are exposed to heat creating inactive proteases, they have a larger amount of turbidity when compared to active proteases. The results showed that kiwi juice, containing the actinidin protein, which has the highest protease activity under all conditions, is a highly effective ingredient to use to preserve the proteins in our everyday items. It also indicates that the protease content of some fruit juices and other foods decreases when heated which leads to protein degradation that results in bitter off-flavors.</p>	
Summary Statement I created a turbidity meter that controls & monitors various processes such as filtration or separation in potable water treatments, beverages, and chemical & pharmaceutical industries to measure protease activity in fruit juices.	
Help Received I designed, built, and performed the experiments with the turbidity meter after an internet search on techniques.	