

**Greater San Diego Science and Engineering Fair  
2015 PROJECT SUMMARY**

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**Project Title:** The Effect of Heat and pH on Vegetables

**Abstract**

**Objectives/Goals:** The objective of this project was to see what the effects of different heat processing did to affect pH and color of 32 different vegetables.

**Hypothesis:** It is hypothesized that the pH levels of the vegetables will raise less than an initial unit of 1.0 pH for all vegetables.

**Methods/Materials:** The materials used during this experiment included petri dishes, 32 vegetables, baking soda, acetic acid, a pH meter, and a camera. At first, three vegetables were tested per trial. These three vegetables were sliced, blended, and baking soda and acetic acid was added. After the pH testing was finished, the vegetable slices that hadn't been blended yet were heated with the processes including roasting, frying, boiling, and steaming. These vegetables were later pureed after heat was applied, and their pH levels were found.

**Results:** Most of the vegetables were naturally acetic, with very few being basic, typically found in high 7's or low 8's. Even after the heat processes, many of the vegetables remained acetic. There were a few that stayed basic, around 7 and 8, and a few that were even neutral, or 7.0. As for the color change, most of the vegetables did change color after baking soda or acetic acid was added, regardless of its pH. For example, for some vegetables, baking soda made the juice lighter while for others acetic acid made the juice lighter. Out of the 32 vegetables, spinach was one of them that had the biggest reaction when heat was applied. After being roasted, the pH levels of the spinach actually went up more than 1.6.

**Conclusions/Discussion:** After the experiment was completed, all of the pH levels were analyzed and the observation that none of the pH values stayed the same was noted. Although many of the pH values didn't vary too much from the control, they had still changed. The effect of heat and pH on vegetables includes color and pH change. For example, after the acetic acid or baking soda was added, some of the vegetable puree had lightened or darkened. Also, after each heat process and the pH levels were checked, the values had changed.

**Summary Statement:** The experimentation completed was to determine the effect of heat and pH on vegetables. To complete this experiment, a total of 32 vegetables were collected and they were all roasted, boiled, steamed, and fried. In addition to these heat processes, baking soda and acetic acid was also added to the vegetables after they were pureed. These different processes were used to discover the pH levels of the vegetables before the heat tests and after the heat tests. Many of the vegetables showed significant change while other didn't, and their pH values didn't vary too much from the control. For example, one vegetable that had a very prominent color change was the turnip. Once placed side by side with the control, the color changes after acetic acid and baking soda were added were very strong. The pH changes contributed to this, making it more acidic or basic which caused the color changes,

**Help Received:** My mentor Dr. Tanya Ditschun helped by telling me some valuable information. My mother taught me how to use excel and provided me with lots of equipment and materials. Finally, my science teacher, Mrs. Gillum who helped revise many of my papers and also told me some errors I could fix.