

First Last

Ms. Tlcek

English 8

19 February 2010

Which Fruit Is More Electrifying?

Abstract

My experiment was conducted to see if fruits put together, could potentially light a light bulb. Also, I wanted to see which fruits had more voltage because the more the voltage, the less fruits it would take to light a light bulb. In my experiment, I tested a variety of different fruits. These fruits were used as my independent variables. To test these variables, I used a multimeter and tested the voltage. According, to my experiment's data, the lemons produced more voltage than apples and oranges.

Introduction

Since the early seventeen hundreds, people have been researching and studying energy and electricity. Here recently, people have been searching for alternatives to energy and electricity. But what people haven't really considered are alternatives that are simpler. For example, fruits and vegetables lighting light bulbs, the common science experiment. My experiment is potentially leading to those alternatives. This research is designed to answer the question: Does a lemon produce more volts than other fruits?

In order to understand if lemons produce more volts than other fruits, one must first understand some key words and the history related to this problem. Two key search words to know are voltage and citric acid. Voltage is and "Electromagnetic force or potential difference, usually expressed in volts." ("Voltage"). This relates to my problem

because I am measuring the amount of voltage in the fruits. Citric acid is “a white odorless acid that has a sour taste and occurs widely in plants, citrus fruits, and the process of Krebs cycle. It is used in medicine and flavoring…….” (“Citric Acid” Science Dictionary 124). Citric acid is in the fruits that I measured and it helped with the conductivity. Two times in history to know are 1747 and 1752. The first circuit was completed in 1747 when “William Watson discharged a Leyden jar through a circuit, that began the comprehension of current and circuit.” (Bellis, Mary “Timeline of Electronics”). The Leyden jar acted like a battery. It contained the stored energy to be used at a later time thus creating a circuit. This began the studying of batteries and electricity. This circuit that William Watson made is similar to my experiment because we both are making circuits. In 1752, Benjamin Franklin officially discovered electricity. However, between 1747 and 1752, he was experimenting with electricity. He also discovered the lightning rod in 1752. This relates to my project because in my project, I’m conducting electricity with the fruits. (Bellis, Mary “Timeline of Electronics”.) Knowing the dates 1747 and 1752 should help you understand my problem more.

In order to understand if lemons produce more volts than other fruits, one must first know some famous scientists and other research that has been done. Two important scientists you’d want to know are Thomas Edison and Michael Faraday. Thomas Edison invented the light bulb in 1878. When he originally invented it, he made lamps that were supposed to be novelty lamps but now power the world. This is related to my project because the point of my project is to see what the voltage is of fruits and to potentially light a light bulb. But you can’t light it without a light bulb. Michael Faraday takes credit for generating electric current on a practical scale. He found that “electricity could be

produced through magnetism by motion. He discovered that when a magnet was moved inside a coil of copper wire, a tiny electric current flows through the wire. Of course by today's standards, Faraday's electro dynamic or electric generator was crude, and provided only a small electric current but he discovered the first method of generating electric power by the means of motion in a magnetic field." ("Who Discovered Electricity?") This is related to my problem because electric current is the process happening in the fruits. That is why these famous scientists relate to my problem. To understand my problem even further, you may want to know a little about Ohm. Georg Ohm is huge when it comes to electricity. He defined scientific laws known as Ohm's Laws. One law states that "the amount of steady current through a material is directly proportional to the voltage across the material divided by the electrical resistance of the material." ("Georg Ohm"). Comparing that to my report, it means that the lemon has less resistance making those electrons flow more. Now that you know Ohm, you should know a lot more about my problem.

This research will attempt to find if lemons produce more volts than other fruits. If the lemon has more acid in it than other fruits then the chemical reaction within the lemon will produce more volts because the lemon is a stronger acid. The stronger the acid, the greater the chemical reaction and the greater the reaction the more concentrated the released electrons are thus creating a greater flow of electricity.

Methods

I used a variety of different fruits including six apples, six oranges, and six lemons. In order to connect these fruits together, I used nine, three and one half inch copper wires. To test the voltage of these items, I used a multimeter. First, I connected the eighteen fruits, orange to orange, lemon to lemon, and apple to apple, using copper wires. I then stuck test

leads on each side of the individual groups of fruit. Next, I tested the voltage of the fruits. Finally, I recorded my data. I decided to connect a lemon to a lemon, an orange to an orange etcetera because I just wanted to test individual fruits, not fruits combined. Also, I chose the fruits I did because they are some of the most common fruits that can be truly tested.

Results

As shown in my graphs, the data collected in my experiment did support my hypothesis, which states, if the lemon has more acid in it than the other fruits then the chemical reaction within the lemon will produce more volts because the lemon is a stronger acid. The stronger the acid, the greater the chemical reaction and the greater the chemical reaction the more concentrated the released electrons are thus creating a greater flow of electricity. During the lemon trial of my experiment, the data shows that the average voltage of the lemons is 0.142. On that note, the average pH level is 3. Therefore, the lower the pH level, the stronger the acid. So as described this supports my hypothesis because the lemon has more voltage. Next, the data in the orange trial concludes that the lemon still has a stronger amount of voltage. The average voltage of the orange trial was 0.08 volts, while the average pH is 4. As you can see by the amount of voltage, that the oranges are just a little less acidic than the lemons which supports my hypothesis. Finally, the data collected during the apple trial clearly supports my hypothesis. The apple comes up in last place with 0.043 volts. Along with the voltage, the pH level is 6. This shows that apples have the smallest acidity. Sources of error are critical when it comes to observations. In my experiment, one source of error could be that in some experiments, a penny, screw, and copper wires are used to test the voltage. This may have made a difference in the

conduction of electricity. Due to the data collected in all three trials, it is clear that the lemons have more voltage than apples and oranges. Also, overall, the lemon has a lower pH level so it also has a greater acidity along with a better conduction of electricity. In the end, the lemon has 0.062 more volts than oranges and 0.099 more volts than apples. In conclusion, I learned that lemons have more voltage than other fruits.

Conclusion

In my experiment, the lemons produced more volts than the apples and oranges. The lemons produced more volts because it has a stronger acid which later results in a greater electricity flow. Also, in the apples and oranges, the electrons aren't as concentrated as the lemons. Therefore, the apples and oranges have less electricity flow. If I were to do my experiment again, I would change the amount of fruits to see if I would get a higher voltage. If my research were pursued, my new scientific problem would be: Do grapefruits produce more volts than lemons? I would like to pursue that because I'd like to see if lemons are more acidic than grapefruits. Addressing this problem would help the world by discovering more about electricity. People who might want to know about my problem are electricians.

Works Cited

- Bellis, Mary. "Timeline of Electronics." About.com. 2009. The New York Times Company. 27 Oct. 2009. <<http://inventors.about.com>>.
- "Citric Acid." Science Dictionary. Boston. Houghton Mifflin Company. 2005.
- "Edison Thomas Alva." World Book. 6th edition. Chicago. World Book. 2006.
- "Georg Ohm." About.com. 2009. 8 Feb. 2010. <<http://inventors.about.com>>.
- "Voltage." Dictionary.com. 2009 Houghton Mifflin Company. 3 Nov. 2009. <<http://dictionary.reference.com>>.
- "Who Discovered Electricity?" The Electricity Forum. 2009. 7 Feb. 2010. <<http://www.electricityforum.com>>.

Appendix 1

| Type of Fruit | Average pH of Fruit | Average Voltage (v) |
|---------------|---------------------|---------------------|
| Lemon | 3 | 0.142 |
| Orange | 4 | 0.08 |
| Apple | 6 | 0.043 |

