CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
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Project Number
J1025

Project Title
Shedding Light on Produce: Comparing the Electrical Output of Organic Cells to That of a Solar Cell

Abstract

Objectives/Goals
The objective of my science project was to determine how many lemons, oranges, or potatoes would be required to make an electric battery that would match a small solar cell's voltage and current in a circuit with an LED. My hypothesis was that the lemons and oranges would make equally more effective cells than the potatoes. I thought this because lemons and oranges are more acidic than potatoes.

Methods/Materials
My control circuit contained a solar cell, bar conductors, a 10KU resistor, a switch, and a red LED. I used a digital multimeter for my measurements. I assembled the circuit, then measured the voltage across the solar cell, and then measured the current through the circuit. Then, I replaced the solar cell with cells made from first oranges, then lemons, and then potatoes, using copper and zinc rods as electrodes, and alligator clip leads. I placed the fruit or vegetable cells in a circuit in series and parallel until there was enough current and voltage to match that of the solar cell.

Results
The lemons proved to be the most effective battery. All my test fruits and vegetables, by themselves, produced between nine tenths and one volt of electricity. The lemons required between two and four cells to produce enough current (0.02 mA) and voltage (1.765 V) to match the solar cell's output. The oranges required four to six cells; the potatoes required six to eight.

Conclusions/Discussion
Although my hypothesis was only partially supported by my data, my results were better than expected, because I had thought that I would need up to twenty of each kind of cell. Theoretically, one could use fruits or vegetables to replace chemicals in powering smaller light bulbs, but widespread use is absurd.

Summary Statement
The focus of my project was to create an effective organic battery using lemons, oranges, or potatoes.

Help Received
My dad taught me AutoCad and supervised my experiment, and my mom tested my procedure for user-friendliness.