CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Mike S. Kostolansky

Project Number
J1810

Project Title
Separating Dyes Using Gel Electrophoresis

Abstract

Objectives/Goals
I wanted to find why dyes being tested (Orange G, Xylene Cyanol, Malachite Green, Crystal Violet) would go the fastest and furthest. I also wanted to learn how to create and use a Gel Electrophoresis apparatus using materials found in a regular household and minimal online shopping. I hypothesized that the Orange G ye would go through the apparatus the fastest and furthest because it had the least amount of base pairs and would therefore go through the microscopic holes in the agarose faster.

Methods/Materials
Dyes (Orange G, Xylene Cyanol, Malachite Green, Crystal Violet), steel wire, small plastic box, agarose, a pipette, TBE Buffer, five 9-volt batteries, styrofoam comb, a pair of pliers, a butter knife, and two alligator clips. Melt and pour the agarose into the box and insert the comb. Let it set for thirty minutes. Cut two slits for electrodes with a knife and insert the steel wires as electrodes. Mix the TBE buffer with four times as much tap water. Add enough buffer to cover the surface with 0.3 cm. Use the pipette to get the four dyes and insert them into the wells created by the comb. Connect the five 9-volt batteries and attach the alligator clips to them. Attach the alligator clips to the steel wire and let the gel run for fifty minutes.

Results
In all of the tests ran the Orange G dye traveled the furthest with an average of 3.4 cm traveled. The Malachite Green came in second averaging 1.975 cm. Xylene Cyanol came in third averaging 1.725 cm. The Crystal Violet came in last averaging 1.30625 cm. In all of the tests Orange G did come in first but in the first two tests, the Malachite Green and Xylene Cyanol traveled the same distance in the first two tests.

Conclusions/Discussion
I found that the Orange G dye (50 base pairs) did go the fastest and furthest in the Gel Electrophoresis apparatus. This proves my hypothesis that because it has the least base pairs, it will travel through the apparatus the fastest and furthest. One hole in this theory is that even though the Xylene Cyanol had the highest amount of base pairs (150 base pairs) it beat out Crystal Violet (125 base pairs) and almost tied with the Malachite Green (85 base pairs). This means that either I had impurities in apparatus, gel, or TBE buffer, or that the Xylene Cyanol dye has special properties that allow it to somehow travel faster and farther even though it has a large amount of base pairs.

Summary Statement
I used a Gel Electrophoresis apparatus to compare the distance migrated between dyes commonly used as marker dyes in Gel Electrophoresis to find out what the differences were and why they were that way.

Help Received
None. I built and performed the experiments myself.