

Enhancement of Photosynthesis Labs using Vernier's SpectroVis Plus

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Abstract

Students blend various vegetable products such as beets, greens, orange and yellow peppers with water in a blender, strain through cheesecloth, and pour into cuvettes or glass test tubes. These are then used in a. a spectrophotometer to create an absorption spectrum, and b. in a Vernier SpectroVis Plus which is a tool that yields a colorful instantaneous absorption spectrum. Surveys reveal that most students feel that the SpectroVis Plus helped them understand the concepts of a. wavelength of light b. absorbance of light energy c. reflection of a color better after the conclusion of the laboratory exercise.



Introduction

What professor has not become frustrated when trying to teach the abstract concept of an action or an absorption spectrum? Our traditional photosynthesis lab to examine some of the optical properties of plant pigments involves conducting chromatography experiments using acetone and other toxic solvents and then cutting out strips of the various resultant bands of color to re-extract the pigments in acetone. It can be very tedious and also take quite a long time to blank the spectrophotometer and take a reading every ten nanometers, which is necessary to obtain a proper absorption or action spectrum. We still have students conduct this exercise in order to show them that the absorption spectrum of chlorophyll is made by making a line to connect discreet data points that they have personally collected. We use an extract of *Spirulina* powder or spinach in acetone, or and use either silicon coated thin-layer chromatography sheets or Whatman No. 1 filter paper. We have decided to add the SpectroVis Plus as a supplement to this traditional chromatography lab. This allows the students to work with a wide array of colorful vegetables and to generate much more data for analysis.



Materials and methods

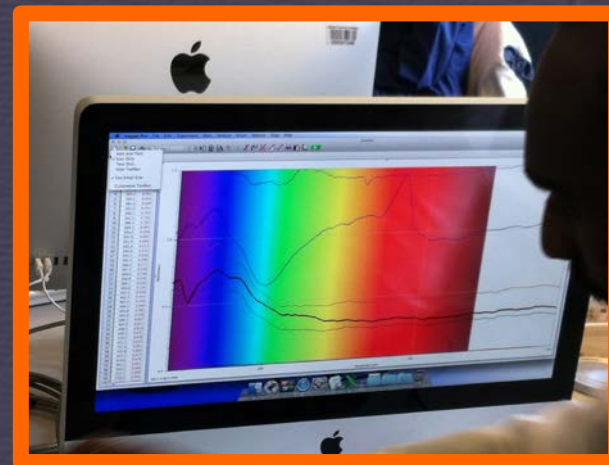
Various fruits and vegetables as pictured
Small paring knife
water
Cheesecloth
Beakers
Mortars and pestles
Test tubes
Pasteur pipettes
Cuvettes
Vernier LoggerPro 3 software
Vernier SpectroVis Plus

The students cut and then mash the various vegetables with the mortar and pestle and water and then strain through a cheesecloth. (We realize that a clearer filtrate is more desirable, but this gives us pretty good results, which we are looking for in an action spectrum.) Plug the SpectroVis Plus directly into the computer, calibrate the blank according to instructions on LoggerPro 3, place the sample cuvette in the SpectroVis, and it reads absorbance over wavelengths from 400-700 nanometers instantaneously



Results and Conclusions

The students get an instantaneous action spectrum of wavelength and absorbance with the corresponding numbers in two columns. The colors correspond to the various wavelengths indicated. The students are excited by the fast results, and by the fact that they are able to test many vegetables in one lab period. We feel that the SpectroVis Plus is a good supplement to a traditional photosynthesis absorption spectrum lab.



What's next?



The SpectroVis Plus also measures fluorescence, which we will measure from a tube of chlorophyll extract.