Axing-Oxidants Across Borders

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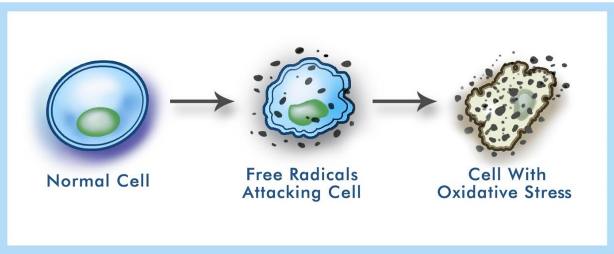
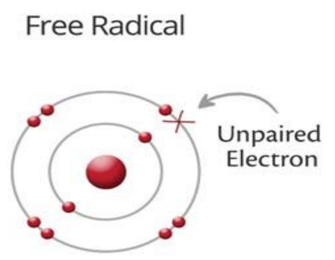
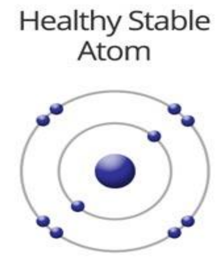
Introduction

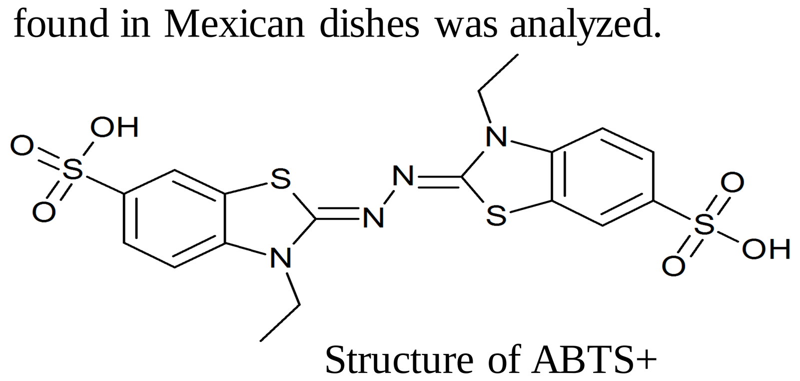
Mexico and Vietnam contain high concentrations of air pollution, which is a cause of **free radicals,** which are any molecular species with an unpaired electron that can exist independently. This means that free radicals are highly reactive atoms that will attack and damage cells. **Antioxidants** neutralize free radicals by donating an extra electron to them. However, when left untreated, excess free radicals create **oxidative stress**, which is a critical imbalance of antioxidant defenses and free radicals. This brings rise to **the promotion of cancer and its growth, Pulmonary Disease, Cardiovascular Disease, and many other human diseases**.



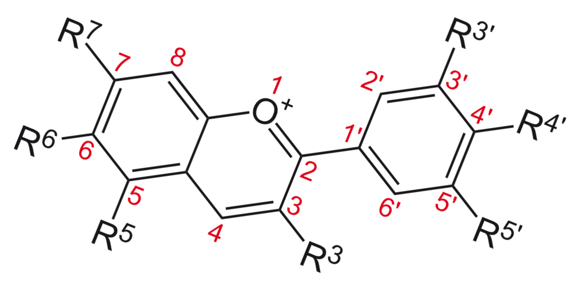




Blue colored free radical called 2,2'-azino-bis(3-ethylbenzthiazoline-6-sulphonic acid), or known as **ABTS+**, can be used in a controlled laboratory environment. Using antioxidants on ABTS+ allows the user in a sample would neutralize the free radicals in the ABTS+ when mixed with it, thus reducing the **absorbance** of the ABTS+. **The less absorbance left in the ABTS solution, then the more antioxidants the sample has**. A common class of antioxidants called **anthocyanin** is correlated to the pigmentation found in a variety of fruits and vegetables. In this experiment, the antioxidant levels of the cucumber and baby spinach, primarily found in Vietnamese dishes, and the jicama and chile poblano commonly found in Mexican dishes was analyzed.

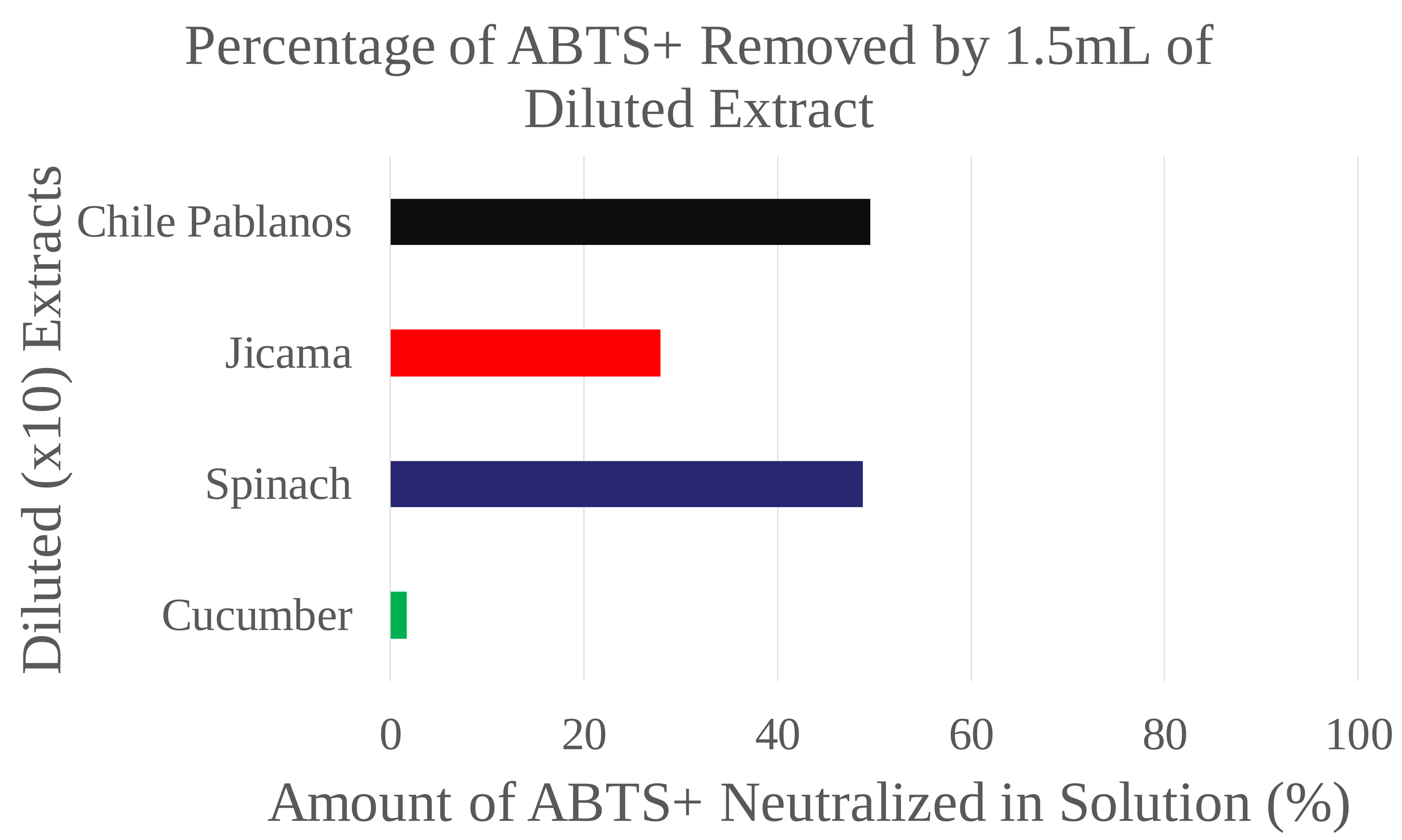


Structure of ABTS+



Structure of an Anthocyanin

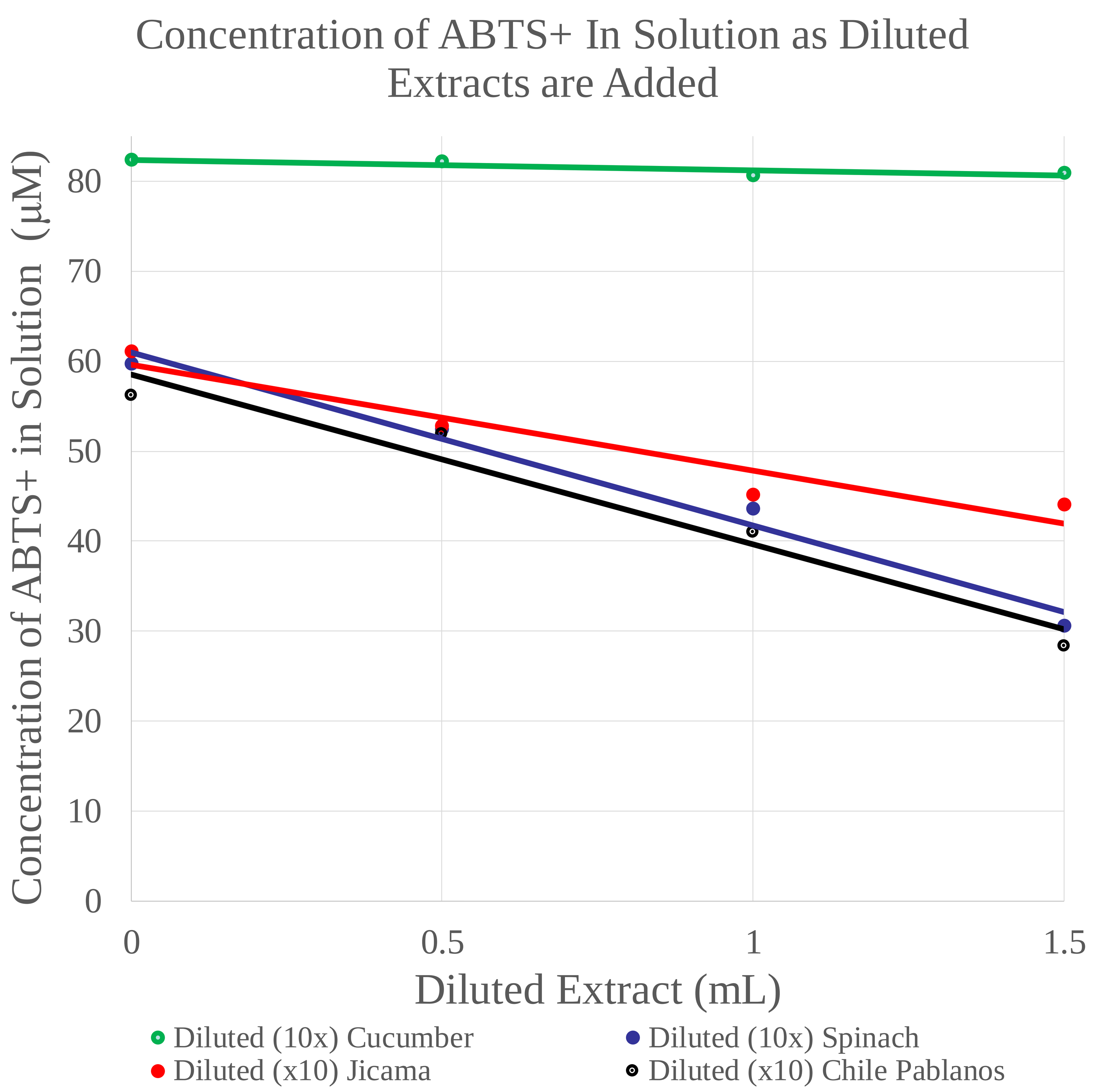
Results



The wavelength that the control had most absorbance was used to determine the absorbance of all samples in that wavelength. After the absorbance of the samples were obtained, then **Beer's Law** was used to get the current concentration graph. Beer's Law is a formula that describes the relationship between the absorbance of the samples and concentration of the ABTS (μM). This formula was proven to be critical in solving for the remaining amount of ABTS+ in the solution after the samples were added.

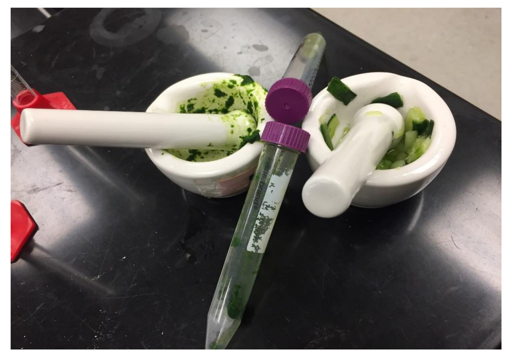
$$A = \varepsilon\, l\, c$$

Beer's Law: A represents the absorption of the solution, ε is the molar absorption constant of the ABTS+, l is the distance the light traveled through the cuvette, and c is the concentration of the ABTS+ remaining in the solution.

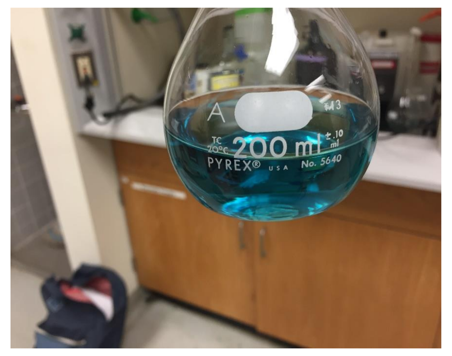


Methodology

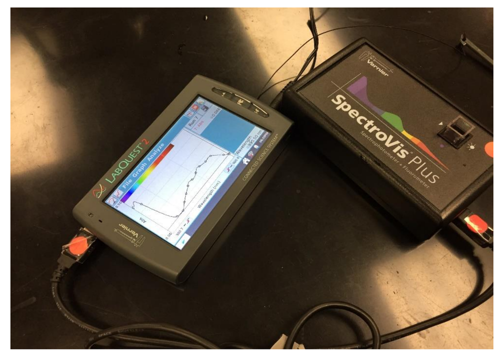
In order to measure the absorbance the samples contained; it is important to follow the methodology of this experiment. One gram of cucumber, baby spinach, jicama, and chile pablanos was crushed into small pieces and placed in separate 15mL conical centrifuge tubes. **Ten mL of acidic methanol** was added to each extract. The extracts were centrifuged and filtered to remove any particles within the liquid extract. ABTS+ was mixed with the samples, which neutralized the ABTS+. The loss of blue coloration in each mixture means that ABTS+ was converted to the stable ABTS molecule, thus the more antioxidants the sample had. The loss of blue coloration, indicating a loss of absorbance, was measured in a **Vis spectroscopy** (Vernier SpectroVis Plus)



Raw Extract with MeOH



Coloration of ABTS+

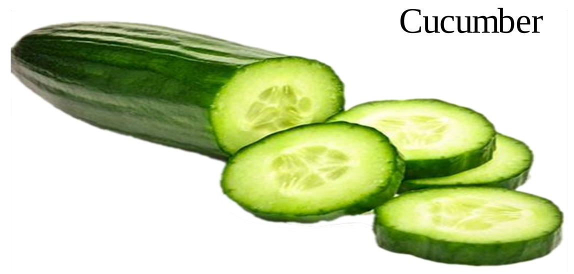


Using UV-Vis Spectroscopy on Samples mixed with ABTS+

Discussions and Conclusion

Antioxidants were detected in all the samples. However, one sample varied heavily and had too little to be considered a significant amount. **Chile poblanos ranked first** with a 49.57% decrease in the concentration of ABTS+ (μM). **Spinach came second** with a 48.80%, **jicama came third** with a 27.92%. Cucumber came in last with a 1.68% decrease. The Mexican and Vietnamese populations have **some vegetables high in antioxidants**, but **more ingredients with antioxidants are needed by the populations**.

Jicama



Cucumber

Spinach

Chile Poblano

Sources

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