"Research in Fluorescence of Sycamore Extracts and the Photophysics of Coumarins"
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The American Sycamore (platanus occidentalis) is a large, deciduous hardwood native to the Eastern and Midwestern United States. This tree's most defining characteristic is its exfoliating bark, which peels off in patches to create a mottled, green-white-brown pattern on the upper trunk and branches. Aside from this, the American sycamore presents a rather fascinating phenomenon: when stirred in water and placed under UV light, wood shavings from this tree emit a beautiful blue fluorescence. In summer 2015, the Muyskens lab identified scopoletin as a fluorescent compound in sycamore wood. The purpose of this summer's investigations was to write a paper describing a classroom demonstration and activity exploring the natural substance fluorescence of sycamore wood.

The most basic method of experimentation used this summer was the extraction, a technique developed previously by the Muyskens lab. To extract the scopoletin from the sycamore wood, I would shave 1.00 grams of wood off of a sample branch with a knife, and mix the shavings in 25 mL of deionized water with 200 μL of dilute ammonia (a base to raise the pH) for 20 minutes. I would then filter out the wood shavings and run various tests on the aqueous extract to determine the relative amount of fluorescence. By changing one variable at a time in this method, such as grinding the wood instead of shaving with a knife or making the solution acidic instead of basic, I was able to compare my results and draw several conclusions.

The first question our research group needed to answer was why freshly cut sycamore samples were barely fluorescent, while year-old samples were beautifully fluorescent. We wanted to find out when the change occurs. To do this, we brought in five fresh branch samples from different trees, and tested the wood and bark over the course of two weeks. Despite some variability, a basic trend emerged quickly: the fluorescence climbed from very little to quite strong within 2-5 days. This was an important recommendation to include in our paper.

This observation led us to ask *why* the fluorescence increases in the first few days after harvest. Thus, we read extensive scientific literature regarding the fluorescent compound, scopoletin. Two papers claimed that scopoletin is produced in response to wounding and abiotic stress. This seems to explain our observation: by cutting the branch from the tree, we are eliciting a stress response from the branch. It just so happens that the compound produced in response to stress also causes beautiful blue fluorescence.

Our third investigation was into scopoletin itself. We already knew that scopoletin was *a* fluorescent compound in sycamore wood; this summer we became confident that scopoletin is the *primary* fluorescent compound. We compared light emission and absorbance spectra of sycamore extracts at high and low pH to pure scopoletin extracts at high and low pH, and the ratios and shapes of the graphs were extremely similar. pH spectrums of the extract compared to the pure compound were even more alike. Thus, we can now safely claim in our paper that scopoletin is the primary fluorescent compound found in sycamore wood.

Aside from the lab experiments, I spent a portion of the summer writing and revising a draft of the paper, which we hope to submit shortly.

This summer has been a wonderful opportunity for me. I have learned a great deal about scientific procedure, instrumentation, and scientific writing, as well as everything I have learned about sycamore trees and scopoletin. Since I hope to pursue scientific writing as a career, the opportunity to participate in writing a scientific paper was invaluable. I greatly enjoyed this summer, and I am incredibly grateful to everyone who made it possible.