

Nature's Medicine: The Science Behind Northeastern Healing Plants

Camila Garcia¹, Dr. Abu Gafar Hossion², Medicine Woman and Clan Mother Shoran Waupatukuay Piper³, Shanelle Thevarajah⁴

The Bridge Academy¹; University of Bridgeport²; Golden Hill Paugussett Tribe³, NRCA Conservation Ambassador Program⁴

Project Motivation & Goals

Using plants for medicine has existed since the earliest days of humanity and our need to treat illnesses.¹

However, even the centuries-old methods used to determine what plant species provided medicinal uses are not always recognized by Western standards of scientific validation.

Get to Know Flavonoids:

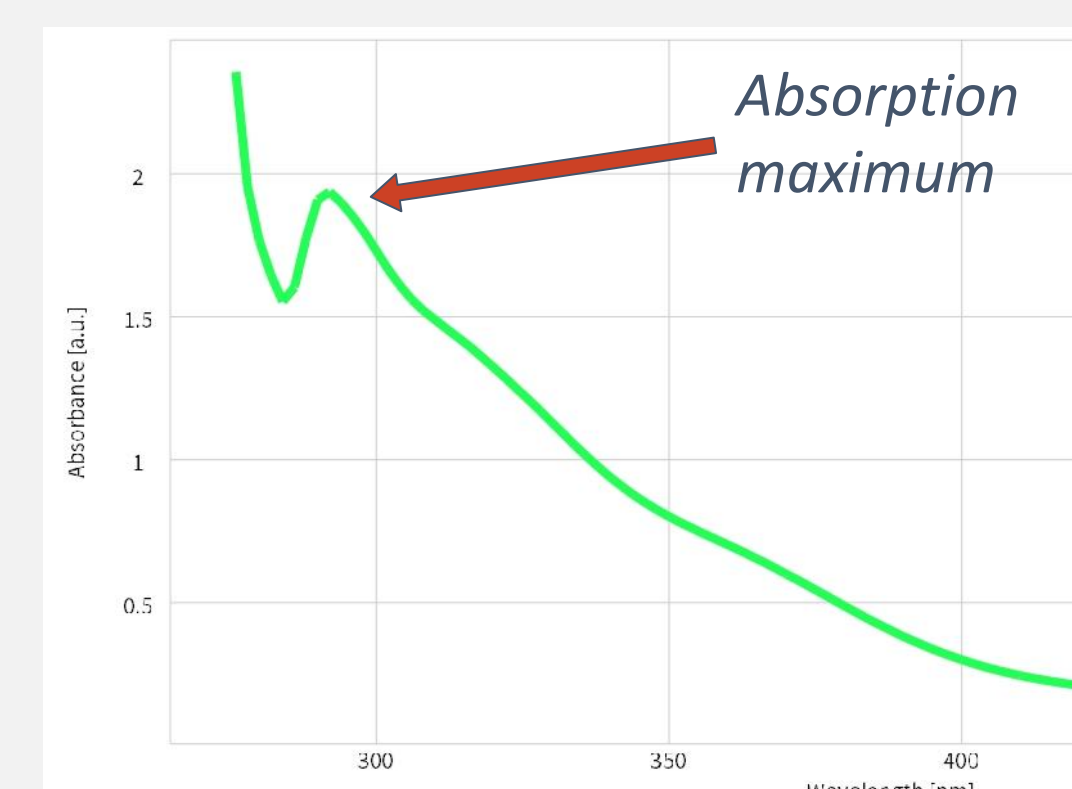
Flavonoids are compounds in plants known for their antioxidant and anti-inflammatory properties when ingested

Overall Goal: Demonstrate that scientific research and botanical (plant-based) medicine can work in harmony

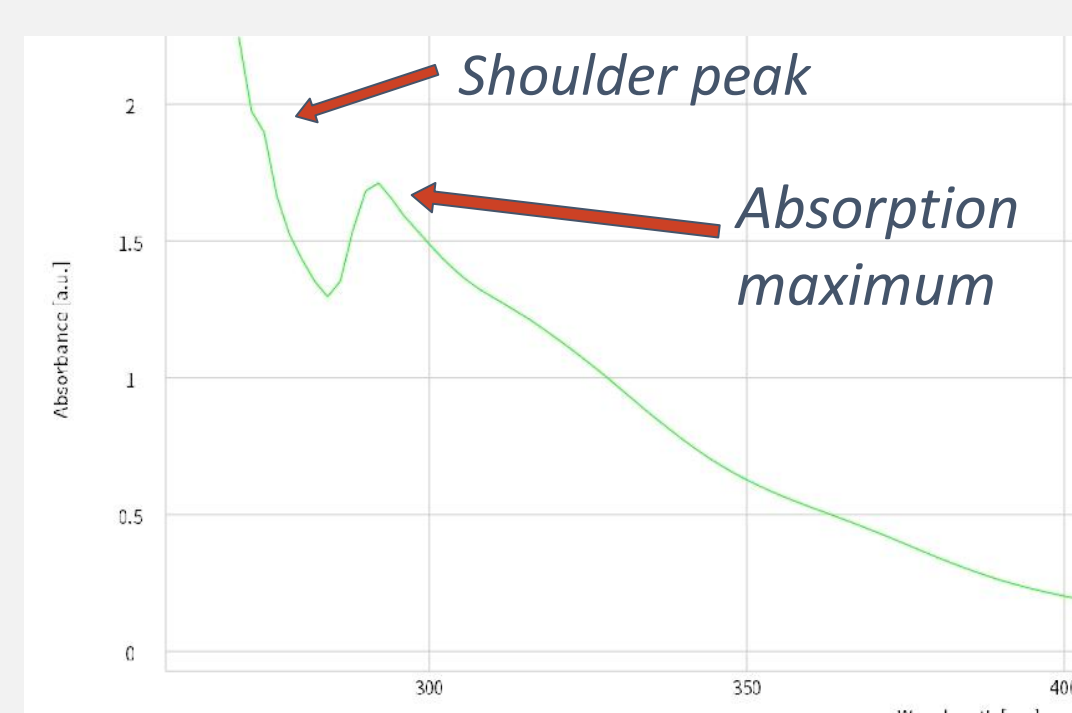
Objectives:

- Identify flavonoids in three plant species historically used for anti-inflammatory and antioxidant properties by local Indigenous tribes
- Contribute to scientific knowledge of their properties
- Educate others about Indigenous botanical medicine through a hands-on workshop

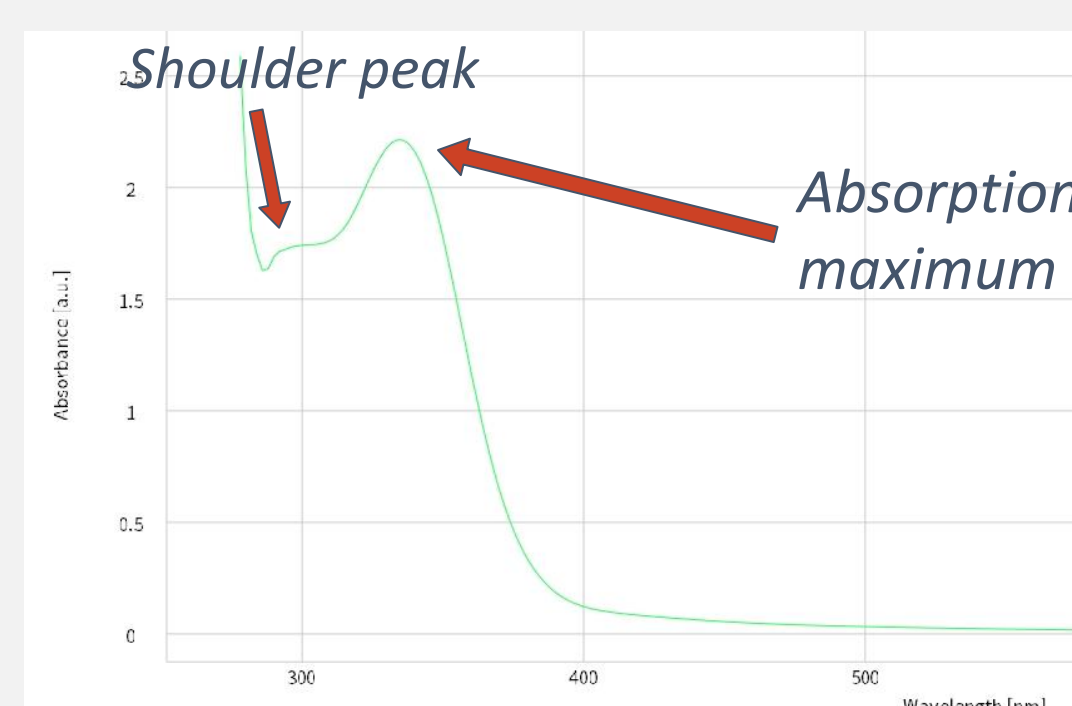
Results and Conclusion



Eastern white pine



Eastern red cedar



Broadleaf plantain

Interpreting the Graphs

- The graph's x-axis represents wavelength (nm) or colors
 - Each color on the visible light spectrum has a certain wavelength
- Y-axis represents absorbance
 - This is how much light the sample soaked up or reflected at each color
- Certain chemicals absorb certain wavelengths better, so large spikes can determine what type of chemicals are in the plant depending on the wavelength
- All 3 plants have peaks either within 240–295 nm (shoulder peaks) or 300–380 nm (absorption maxima)
 - These types of peaks are typically characterized as peaks for flavonoids²

Therefore, **I can conclude a high potential for flavonoid presence in each plant**

UV-Vis spectrometer graphs of each plant's methanol extracts

Research Methods

Plant Species (left to right)

- Broadleaf plantain (*Plantago major*)
- Eastern red cedar (*Juniperus virginiana*)
- Eastern white pine (*Pinus strobus*)



Preparation of Plant Extracts in University of Bridgeport Lab

- Sampled ≥ 2 g of each plant (purchased on Etsy)
- Mechanically removed moisture from each sample over the span of 5 weeks
- Ground each plant into a fine powder
- Stored samples in a -4°C freezer
- Prepared two solutions – 100% distilled water and 3:2 methanol to water
 - Methanol pulls significantly more compounds from a substance, but is highly evaporative, so dilution was needed
- Added 1 g of plant powder to 10 mL of each solution
- Mixed both types using a rocking platform for 20 hours
- Mechanically separated liquid from powder for each sample
- Filtered out liquid into new tubes, successfully creating plant extracts

Extract Analysis and Flavonoid Identification

- Each extract underwent spectrometry tests to conclude flavonoid potential
- Spectrometers work to detect what chemicals are possibly present in a sample through interpreting their graphs
- Chromatography is another process that can detect a specific type of chemical in a sample (e.g. quercetin is a type of flavonoid)
 - Chromatography could not be carried out due to time constraints



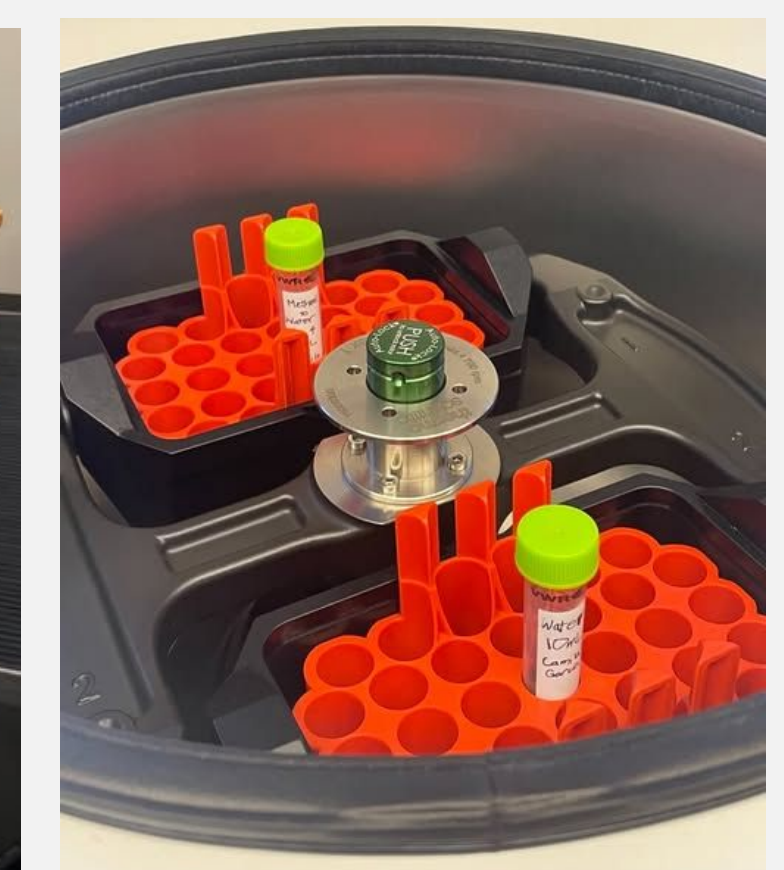
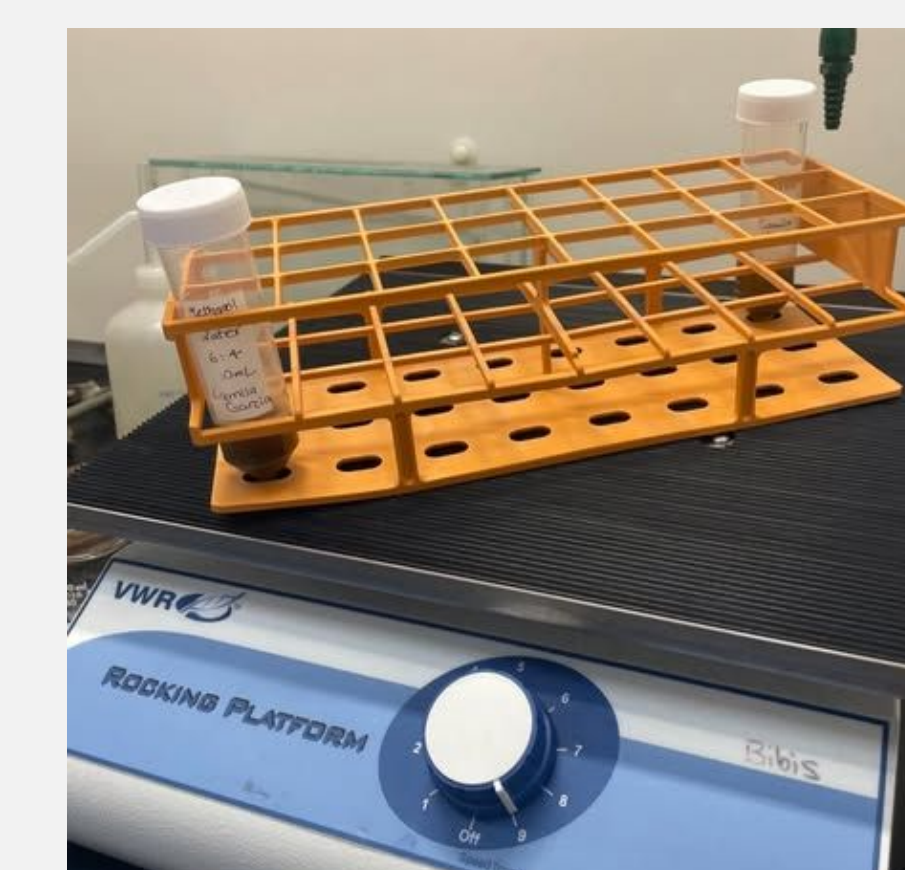
Initial plant samples from left to right: eastern red cedar needles (*Juniperus virginiana*), eastern white pine needles (*Pinus strobus*), and broadleaf plantain leaves (*Plantago major*)

Mechanically removing moisture from each sample using a lyophilizer (top) and dessicator (bottom)



Dr. Abu Gafar Hossion, University of Bridgeport's Chair of Chemistry provided step-by-step guidance in the chemical processes.

Dr. Hossion and me at UB RISE, a research conference at the University of Bridgeport where I presented this project to local scholars



Mixing *P. major* solutions on rocking platform (left); mechanically separating powder and liquid of *P. major* solutions in a centrifuge (center); *P. major* extract in spectrometer (right)

Community Outreach

Clan Mother Shoran Waupatukuay Piper

As the Medicine Woman of the Golden Hill Paugussett Tribe, Shoran informed me of what Northeastern plants were antioxidants and anti-inflammatories through an interview. In addition, she helped me facilitate a workshop at my school in which 20+ attendees learned about Indigenous botanical medicine and made a topical healing salve containing broadleaf plantain!

Indigenous Medicine Workshop

This event was organized and hosted by the service and leadership club I run at my school, Interact Club. Shoran began by explaining some uses of broadleaf plantain in her tribe and led us in creating healing salves using beeswax and plantain-infused oil. We had time at the end for attendees to ask her about medicinal plants and Indigenous culture, practices, and history.



Left: Shoran (3rd from the right) and my event volunteers; Center: Plantain-infused oil for the salve; Right: Melting beeswax to hold the oil and its properties

Broader Impact and Key Takeaways

My findings can be a **first step into more accepted, regulated use of medicinal plants** and perhaps even drug development as we acknowledge their natural healing power. However, any future findings do not automatically disprove the centuries of Indigenous wisdom used in determining medicinal plants. The workshop that I hosted is an example of how we can our open communities' eyes to the value Indigenous peoples have historically brought, and continue to bring, to botanical-based medicine.

It is important to **be cautious of exploiting the natural resources that Indigenous communities rely on** as this knowledge enters the larger scientific community. Although some medicinal plants may grow right in our backyards, we should **be mindful of ethical consumption**.



Acknowledgements and References

Thank you to the NRCA CAP staff, especially my mentor Shanelle, for her invaluable support and feedback. I received funds for NRCA funds for project supplies. Thank you to the Interact Club volunteers that helped facilitate our event. Thank you to my friends, family, and teachers for your enthusiasm and interest in my project.

- Petrovska B. B. (2012). Historical review of medicinal plants' usage. *Pharmacognosy reviews*, 6(11), 1–5. <https://doi.org/10.4103/0973-7847.95849>
- Masahiko Taniguchi, Connor A. LaRocca, Jake D. Bernat, and Jonathan S. Lindsey *Journal of Natural Products* 2023. 86 (4), 1087–1119. DOI: 10.1021/acs.jnatprod.2c00720