Plant and Succulents: Unbarcoded Species

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URBAN BARCODE RESEARCH PROGRAM

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Abstract:

The goal of this project is to successfully barcode three unbarcoded species. DNA barcoding is an important practice for correctly identifying species of plants and animals. To contribute to the collective scientific knowledge of the environment and plants that we encounter daily, we conducted a study to barcode the DNA of the Wild Pansy, and two plants that belong to the *Curio* genus, *Senecio Peregrinus* (Dolphin Necklace), and *Senecio Radicans* (String of Bananas). Through months of speaking with teachers and completing day-long labs, our group was able to barcode the *Viola tricolor var. Hortensis,* the *Senecio Peregrinus* and the *Senecio Radicans*. Through our results, we were able to find out new information on these plants, some regarding their medicinal purposes along with each of the plant's ancestral connections.

Introduction:

The *Viola tricolor var. Hortensis,* commonly known as the Pansy, is a common garden plant that has extensive medicinal properties. The Pansy is rich in antioxidants and is therefore used by many to this day as a supplement. Some of the phytochemicals that comprise pansies include flavonoids and coumarin. Coumarin is a compound that has blood thinning, anti-fungal, and anti-tumor properties. It also increases blood flow and reduces capillary permeability.

The *Senecio Peregrinus,* or more commonly known as the Dolphin Necklace, is a unique succulent. Originating in South Africa this plant is part of the Curio genus. The Dolphin Necklace also produces white blossoms that give off a cinnamon scent. Although this succulent should not be ingested due to its mild toxicity, it does have other benefits. Succulents are amazing plants that help to purify and add oxygen to the environment.

The *Senecio Radicans* are commonly known as a string of bananas, coming from the Asteraceae family and Curio genus. The succulent is able to survive in tropical to arid conditions, as its tissue is able to conserve moisture. It, however, cannot withstand freezing temperatures. During the late winter through early spring, the succulent produces small, cinnamon-scented flowers.

Materials and Methods :

- **Extracted DNA from *Viola tricolor var. Hortensis, Senecio radicans* and, *Senecio Peregrinus***
- **Perform PCR replication and amplification**
- **Upload results on the blue line of DNA Subway.**
- **Use MUSCLE BLAST Alignment to analyze differences between consensus sequence and our planets.**
- **Use phylogenetic trees ML and NJ to analyze evolutionary relationships and common ancestors.**

Results:

Figure 1:

Viola tricolor var. Hortensis (KJR-001) shares the same changes with the plants listed 2-6. It shares all of the same features and base-pair patterns with any plants labeled under "viola_tricolor" because they are plants of the same species, and therefore have the same DNA. Pansies can come in many varieties of colors, but overall, their DNA does not deviate from the same base pairings. Additionally, *Senecio Peregrinus* (KJR-003) and *Senecio Radicans* (KRJ-002) have a similar sequence. Both plants have similar sequences because they originate from a common ancestor. They are different types of succulents that come from the *Senecio* genus, and also both have origins in the *Asteraceae* plant family.
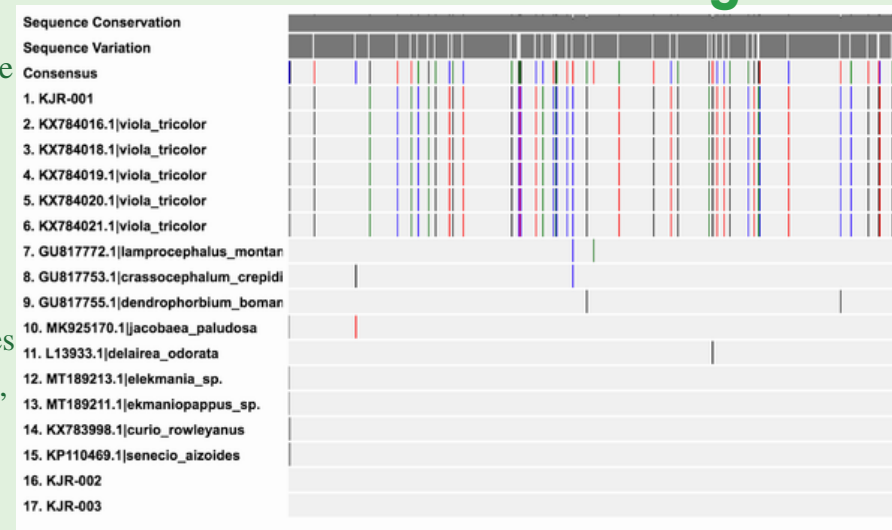

Figure 1

Figure 2:

An observation that can be made from the PHYLIP NJ tree is all of the samples share a common ancestor. However, Viola tricolor var. Hortensis has slightly mutated from its common ancestor however, Senecio Peregrinus and Senecio Radicans have mutated more. Both plants share many common mutations and ancestors compared to Viola tricolor var. Hortensis. Senecio Peregrinus and Senecio Radicans are both different types of succulents. *Senecio* is a large genus of varying plants within the daisy family. Meanwhile, Viola tricolor var. Hortensis is from a different genus than the other two plants. It is a member of the *Viola* genus, which is part of the *Violaceae* family. The wild pansy is part of a section of the *Viola* genus known as *Melanium*. Polyploidy and hybridization have affected the evolution of this group causing a wide range of chromosome numbers.

Figure 2
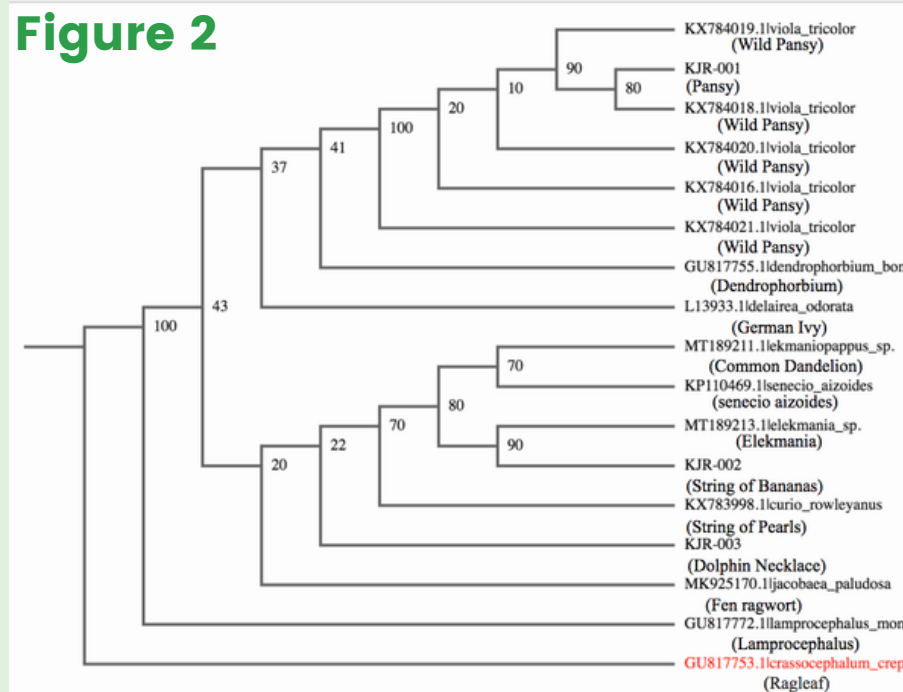
Discussion:

Through generating the DNA barcodes of three common plants, students were able to help expand the knowledge of the world around them and improve the quality of life on Earth. With our discoveries, we will build on the existing knowledge of the life-changing properties of plants that were previously considered mundane or solely used for their appearance.

Using the MUSCLE program, we were able to discover that *Viola tricolor var. Hortensis* shares all of the same features and base-pair patterns with any plants labeled under "viola_tricolor" as they come from the same species. Further, the program revealed that *Senecio Radicans* and *Senecio Peregrinus* have a similar sequence due to a common ancestor. Both succulents come from the *Senecio* genus and originate in the *Asteraceae* plant family.

There are many benefits that come from a succulent plant like String of Bananas and Strings of Dolphins. One of these properties is air purification. They aid in purifying the air while adding oxygen to the environment. Upon completing more research regarding these plants we discovered that succulents can be extremely beneficial for the environment. By planting more succulent plants around highly polluted areas it is possible that air could become cleaner and less polluted over time. Another way in which succulent plants can be highly beneficial to our environment is by reducing the effect caused by climate change. Succulents are drought-tolerant plants that can be beneficial in areas with less water. Succulent plants use accumulated water to keep their metabolism going during periods of drought.

In the ever-changing world, it is important for knowledge to continue to grow alongside it. The student's contributions will help rejuvenate the state of our planet and ultimately broaden our awareness of the multifaceted nature of the surrounding world.

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