



Cilantro, or No?

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Abstract

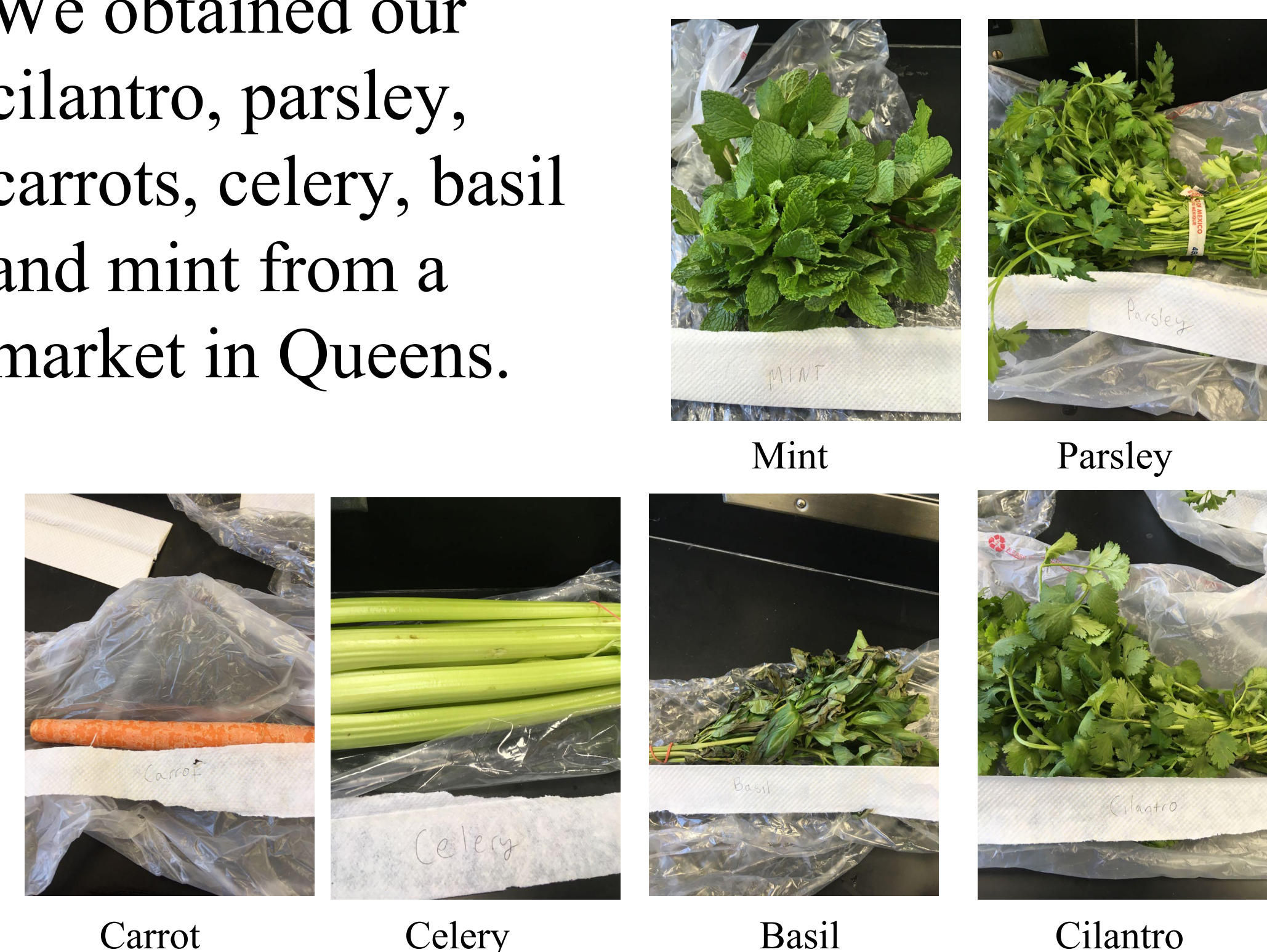
The goal of our project was to analyze the relationship between different herbaceous species. In this study we collected, sequenced, and analyzed DNA from cilantro, basil, mint, parsley, celery and carrots to see if there would be a stronger relationship between phenotypically similar plants or between similar herbs that are used in ancient homeopathic medicine. We sequenced various samples to determine their genetic relationships. In conclusion, our results were consistent with those of traditional taxonomy.

Introduction

Scientists have traditionally used phenotypic methods to classify organisms. DNA barcoding is a method of identifying species based on their unique, species-specific, DNA “barcode.” For plants, the plastid sequences *rbcL*, *matK*, and *trnH-psbA* and the nuclear sequence ITS are the most commonly used. ¹Scientists have previously categorized parsley, cilantro, celery, and carrots in the Apiaceae family ³. These plants have an umbrella shaped flower cluster called an umbel, and have hollow stalks ⁴Traditional Chinese medicine has many ancient classifications of organisms.

Materials & Methods

We obtained our cilantro, parsley, carrots, celery, basil and mint from a market in Queens.



We then isolated and purified the chloroplast DNA of each sample DNA Barcoding Protocol: Isolating DNA by the DNA Learning Center. After this we amplified the DNA through PCR using the PCR protocol. Lastly, before sequencing, we ran the DNA sample through gel electrophoresis in order to ensure that DNA was present in each of our samples. After ensuring that the PCR worked we sent our samples away for sequencing.

We used DNA Subway to analyze the results of our sequencing as well as an aid in order to make taxonomic connections We used BLAST, Basic Local Alignment Search Tool, in order to compare our sequences to those already in the database to identify our samples

Results

Based on DNA Subway only three of our 6 samples had blast results that matched the samples:

- Carrot, basil and mint the BLAST results were correct with 0, 1 and 0 mismatches on the *rbcL* gene
- Cilantro, parsley and celery unfortunately our results were not as clear or accurate
- All the various samples species were from the *Apiaceae* Family which is the common family of aromatic flowering plants
- Parsley and celery blasts matched many herbs used in Asian herbal medicine including, *Hyssopus officinalis* and *Zizia aurea*

Tables & Figures

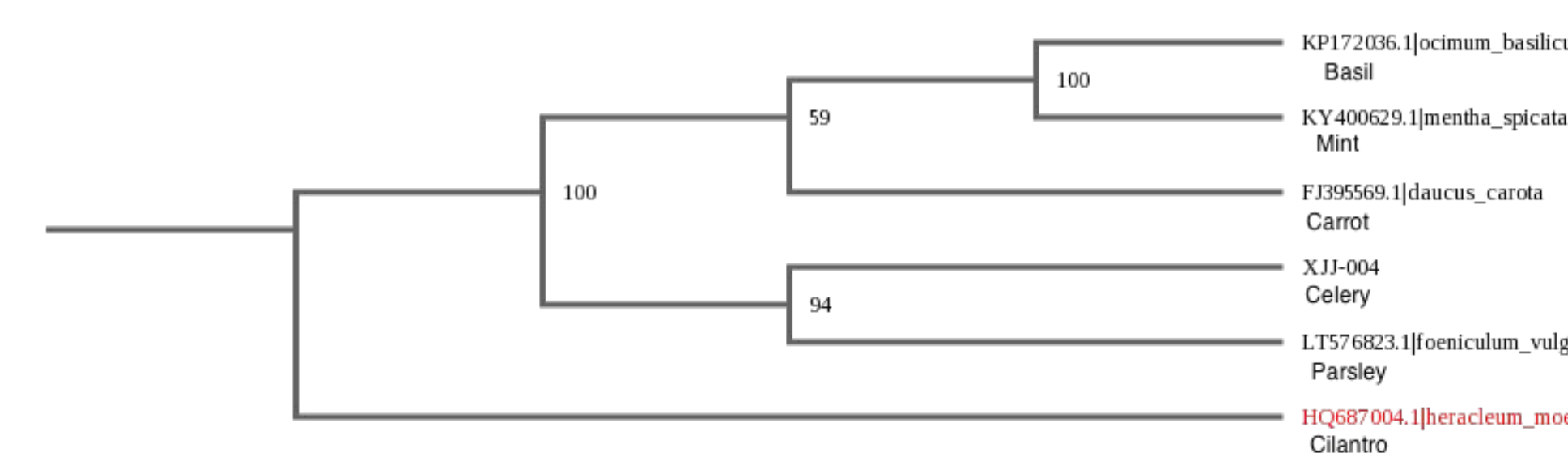


Figure 1. Phylogenetic Tree of our samples showing evolutionary relationships

XJJ-001-F	TGTTGGATTCAAGCTGGGTTAAAGATTACAATTGCTTTATATACTCTCCGATCAAAAC	E	x	Cilantro
XJJ-001-R	CGCCAGTATGTCACCAACAGAGACTAAAGAGGTTGGATTCAAGCTGGGTTAAAG	E	x	Carrot
XJJ-003-F	CAGGTTGGATTCAAGCTGGGTTAAAGATTACAATTGCTTTATATACTCTCCGATCAAAAC	E	x	Celery
XJJ-003-R	CGCCAGTATGTCACCAACAGAGACTAAAGAGGTTGGATTCAAGCTGGGTTAAAG	E	x	Basil
XJJ-004-F	CAGGTTGGATTCAAGCTGGGTTAAAGATTACAATTGCTTTATATACTCTCCGATCAAAAC	E	x	Mint
XJJ-004-R	TGTTGGATTCAAGCTGGGTTAAAGATTACAATTGCTTTATATACTCTCCGATCAAAAC	E	x	Cilantro
XJJ-005-F	CGCCAGTATGTCACCAACAGAGACTAAAGAGGTTGGATTCAAGCTGGGTTAAAG	E	x	Parsley
XJJ-005-R	CAGGTTGGATTCAAGCTGGGTTAAAGATTACAATTGCTTTATATACTCTCCGATCAAAAC	E	x	Carrot
XJJ-007-F	CAGGTTGGATTCAAGCTGGGTTAAAGATTACAATTGCTTTATATACTCTCCGATCAAAAC	E	x	Mint
XJJ-007-R	CGCCAGTATGTCACCAACAGAGACTAAAGAGGTTGGATTCAAGCTGGGTTAAAG	E	x	Cilantro
XJJ-009-F	ANGCAGTGTGGATTCAAGCTGGGTTAAAGATTACAATTGCTTTATATACTCTCCGATCAAAAC	E	x	Cilantro
XJJ-009-R	CGCCAGTATGTCACCAACAGAGACTAAAGAGGTTGGATTCAAGCTGGGTTAAAG	E	x	Parsley
XJJ-010-F	ANGCAGTGTGGATTCAAGCTGGGTTAAAGATTACAATTGCTTTATATACTCTCCGATCAAAAC	E	x	Parsley
XJJ-010-R	CGCCAGTATGTCACCAACAGAGACTAAAGAGGTTGGATTCAAGCTGGGTTAAAG	E	x	Carrot
XJJ-011-F	ANGCAGTGTGGATTCAAGCTGGGTTAAAGATTACAATTGCTTTATATACTCTCCGATCAAAAC	E	x	Celery
XJJ-011-R	CGCCAGTATGTCACCAACAGAGACTAAAGAGGTTGGATTCAAGCTGGGTTAAAG	E	x	Carrot
XJJ-012-F	ANGCAGTGTGGATTCAAGCTGGGTTAAAGATTACAATTGCTTTATATACTCTCCGATCAAAAC	E	x	Celery
XJJ-012-R	CGCCAGTATGTCACCAACAGAGACTAAAGAGGTTGGATTCAAGCTGGGTTAAAG	E	x	Basil
XJJ-013-F	ANGCAGTGTGGATTCAAGCTGGGTTAAAGATTACAATTGCTTTATATACTCTCCGATCAAAAC	E	x	Basil
XJJ-013-R	CGCCAGTATGTCACCAACAGAGACTAAAGAGGTTGGATTCAAGCTGGGTTAAAG	E	x	Mint
XJJ-014-F	ANGCAGTGTGGATTCAAGCTGGGTTAAAGATTACAATTGCTTTATATACTCTCCGATCAAAAC	E	x	Mint
XJJ-014-R	CGCCAGTATGTCACCAACAGAGACTAAAGAGGTTGGATTCAAGCTGGGTTAAAG	E	x	Mint

Figure 2. DNA sequences of the samples that were barcoded

Discussion

Based on our results from DNA barcoding, basil and mint proved to be the most closely related, and they have been traditionally grouped in the same taxonomic families based on phenotype. Although our BLAST results for cilantro and parsley did not come out perfectly, both were shown to be in the carrot family. These two herbs have been grouped together in Chinese medicine for millennia, and they have very similar sequences. The molecular taxonomic method in these cases backs up the traditional methods. Our results showed that there is a genetic basis to taxonomic categories that were simply based on phenotype

References

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