

Plant based Supplemental vitamins



According to the FDA's website "FDA is not authorized to review dietary supplement products for safety and effectiveness before they are marketed." which means the only people to will know what is in the supplements before it is sold are the companies themselves.

According to the FDA "Many supplements contain active ingredients that have strong biological effects in the body. This could make them unsafe in some situations and hurt or complicate your health."

Research question

Have supplement companies been lying about what they put inside supplements?



Variables and hypothesis

Variables

- Independent Variable: We tested nine different supplements from three different supplement companies.
- Dependent Variable: We determined the types of plant tissue used in the supplements using DNA Barcoding techniques.
- Hypothesis: our Hypothesis was that the plants inside the supplement would match with what the supplement companies claimed were inside their supplements.



Experimental design

- We obtained 9 different supplements from local grocery stores.
- We then extracted the DNA from our supplements.
- Next we amplified the rBcL gene and the matK gene from the DNA extraction.
- Lastly we sequenced the results and identified them with DNA Subway.



Results of gene Amplification

-We were able to amplify the RBCL gene in 2 of our 9 samples

-we were only able to amplify the matk gene in 1 of our 9 samples

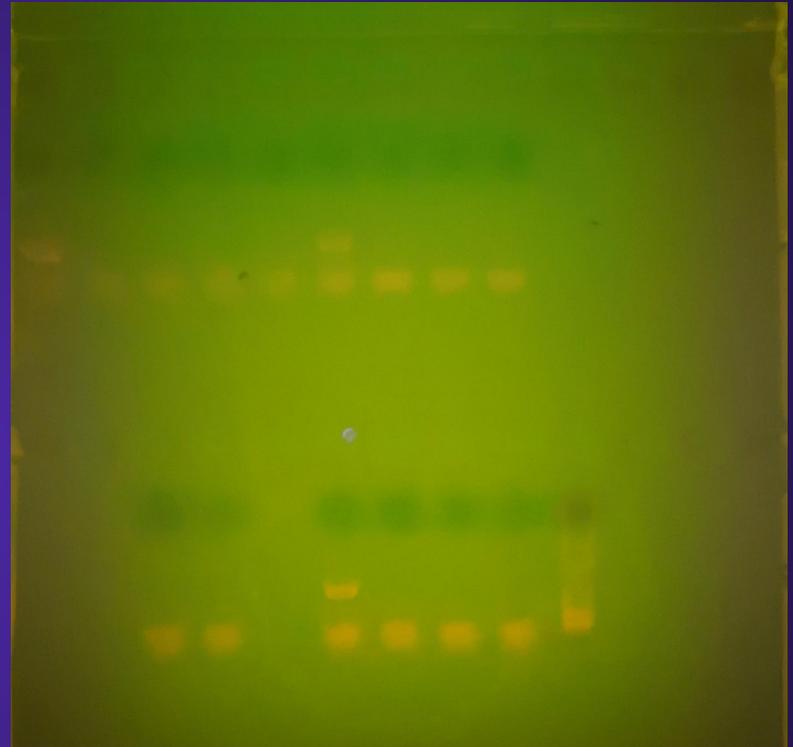


Figure 1: Results of PCR of supplement samples.

Results of DNA Sequencing

We obtained 1 high quality gene sequences from the 3 supplement sent in for gene sequences

| | | |
|--|---|---|
| AlfalfaRBCL-RBCLForward_B08 |   | NNNNNAGACTNNNCACGGTTGGGTTCAAAGCTGGTGTTAAAGATTATAGATTGACTTATTATAC |
| MATK6a-MATKForward_C09 |   | NNNNNNNNNNNNNNNGNGNGNATGCCTCTTCTTTTCATTTATTACGGTTCTTTTTTCACGAGTAT |
| NettleLeafMATK-MATKForward_A08 |   | NNNNNNNNNNNNNNNNNNNNNGNNNGTTTTTGTTTTNGTATTAATTGNGCTTCTTTAATCTTC |
| NettleLeafRBCL-RBCLForward_H07 |   | NNNNNNNNNNNNNNNNNNNGNNGGNGNNGATTCTNGCTGGTGTTAAAGATTATAAATTGACTTA |

Figure 2: DNA sequence from DNA subway the red explanation mark means the sample did not sequences well

Results of DNA Barcoding

- Samples were identified with the BLASTIN function of DNA subway
- Several potential matches were obtained for each of the gene sequences.

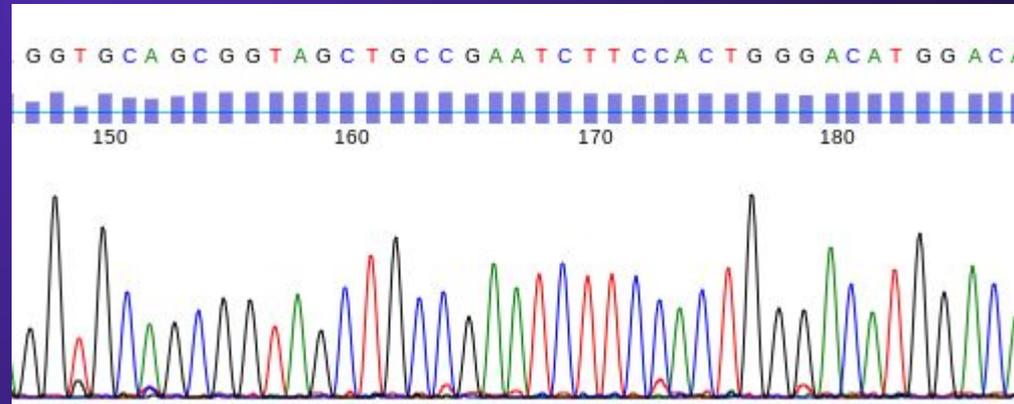


Figure 3: Electropherogram of Alfalfa RCBL sample

Results of DNA Barcoding

- We matched the results of our DNA barcoding with species identification using a simple google search.
- After we identified the supplement, we then compared it to what was listed on the supplement container.
- For the 1 sample that was successfully identified, our results matched what was listed on the container of the supplement.

About

Alfalfa, also called lucerne, is a perennial flowering plant in the legume family Fabaceae. It is cultivated as an important forage crop in many countries around the world. It is used for grazing, hay, and silage, as well as a green manure and cover crop. The name alfalfa is used in North America. [Wikipedia](#)

Scientific name: *Medicago sativa*

Figure X: Results from Wikipedia about alfalfa including its scientific name.

| ◆ # | Accession # | ◆ Details | ◆ Aln. Length | ▼ Bit Score | ◆ e | ◆ Mis-matches |
|-------|-------------------------------------|---|---------------|-------------|-----|---------------|
| 1(1). | <input type="checkbox"/> MN601455.1 | Medicago sativa ribulose 1,5-bisphosphate carboxylaseoxygenase large subunit (rbcL) gene, complete cds - <i>Medicago sativa</i> ribulose 1,5-bisphosphate carboxylaseoxygenase large subunit (rbcL) gene, complete cds | 572 | 1028 | 0.0 | 1 |

Figure 4: One of matches for Alfalfa RCBL from BLASTIN function on DNA subway.

Conclusion

Our results did support the hypothesis **that the plant inside the supplement would match what the bottle claims is inside.**

The data showed that what was sequenced from the supplements matched what was on the bottle and there was no evidence that supplement companies mislead the public.

Conclusion

Final thoughts:

We believe that most of our errors arose during DNA extraction. We think that this is the case because we split the extraction into 2 different days which might have caused the DNA to not extract properly.

The one supplement that was amplified successfully did support our hypothesis that the ingredients contained in supplements accurately reflect what is advertised.

In the future we would recommend groups to complete the DNA extraction on a single day. If that still fails they should use a higher quality extraction.

Work Cited

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