



Determining the effects of herbicides on Long Island's spider biodiversity and environmental implications using DNA barcoding



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Abstract

The purpose of this study was to collect spiders from two different locations, one treated with herbicides and one without, to test the biodiversity of the spider population in those areas. The main point of the research was to examine how herbicide application might affect other non-target species, including humans. The specimens were collected from Old Westbury Equestrian Center, a pesticide free location, and the Old Westbury Golf Course, a highly sprayed herbicide area. We wanted to test what environmental impacts it may have.

Introduction

Exposing a particular spider to herbicides has been shown to result in that species catching prey faster. However, one study indicated that exposure to herbicides delayed spider maturation, as well as making them more likely to experience molting errors. Our group expects the herbicides found in the environment to have fatal effects on spiders, therefore lowering overall biodiversity. Based on our findings, we will assess what effects a decrease or increase in biodiversity has had on the environment, as well as the potential impacts going forward, including contamination in our water supply or aerial drift. Hopefully we can observe what spider species were better suited to withstand the toxicity of the chemicals as well.

Materials & Methods

We collected from Old Westbury Equestrian Center and the Old Westbury Golf and Country Club. We collected from similarly landscaped areas, near trees and tall grasses. We used a small paintbrush to knock the spiders into collection tubes. We then froze them for 15 minutes to euthanize them. After photographing the specimens, we collected pieces of the spider's legs. We then isolated the DNA using the silica protocol. After isolating the DNA, we attached primers to the end of the new sequences for the CO1 gene and amplified the DNA band. The amplicon was then sent off for sequencing, and we received the results. We then used DNA Subway and Barcode of Life Data System (BOLD) to analyze the sequence and interpret the data.



Results

The results from the Old Westbury Equestrian Center show that five of the samples are of the same species: *Parasteatoda tepidariorum*, and three are of different species: *Pholcus opilionoides*, *Pholcus manueli*, and *Cyclosa turbinata*. At the Old Westbury Golf Course, five of the specimen collected were also *Parasteatoda tepidariorum*. The results from the golf course additionally show the three other samples were different species: *Leucauge venusta*, *Takayus lyricus*, and *Yunohamella lyrica*.



- 2. XQX-005
- 3. XQX-004
- 4. XQX-012
- 5. XQX-014
- 6. XQX-015
- 7. XQX-009
- 8. XQX-016
- 9. XQX-010
- 10. XQX-011
- 11. XQX-007
- 12. XQX-006
- 13. XQX-018
- 14. XQX-008
- 15. XQX-002
- 16. XQX-013



Discussion

Based on the small sample size collected, the biodiversity within the two environments is equal. This then contradicts the expected outcome: more variation among the barn spiders. While herbicides seem to have no effect on the diversity of spider species according to the results of this experiment, more research must be done to make an accurate determination, however, until then, it seems the golf course and the barn are both suitable habitats for a small range of different species.



References

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