Effect of Garlic Mustard (*Alliaria petiolata*) Removal on the Ectomycorrhizal Fungi in a Restored Woodland

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Introduction

- **Invasive Plant:** a plant that has the ability to thrive and spread aggressively outside its native range.
  - Invasive plants can **compete and drive out native plants**.
  - They also can **cause less noticeable effects on the underground fungal networks** that connect native plants with each other. (Stinson et al.)

Introduction cont.

- **Ectomycorrhizal Fungi:** a symbiotic association between a fungus and the root system of a host plant.
  - Around **85% of vascular plants** create these associations with fungi. (Schüßler et al.)
  - Most of these relationships are **mutual**.
    - The **fungus receives nutrients from the plant** since they do not photosynthesize.
    - The fungi transport nutrients between plants and **increase nutrient and water uptake.**

Introduction cont.

- **Garlic Mustard:** A highly invasive allelopathic plant.
  - Garlic Mustard is fairly widespread throughout the United States and negatively influences native plants by **secreting oils that inhibit plant growth**.

Purpose/Goal

Purpose
Investigate the effects of invasive plants on Ectomycorrhizal Fungi in an effort to better understand the impact of invasive plants
on the environment and to determine the efficacy of the removal of Garlic Mustard in the restoration of an area of forest

Goal
Investigate the effects of Garlic Mustard on Ectomycorrhizal Fungi by comparing an enclosure where Garlic Mustard is actively removed to an area where Garlic Mustard is not controlled.

Hypotheses

1

A **Lower Percent Colonization** will be found in the area with Garlic Mustard

2

The site where Garlic mustard has been removed will have the **second largest Percent colonization**

3

Root Biomass will be **greater** in the areas without Garlic Mustard

Methods

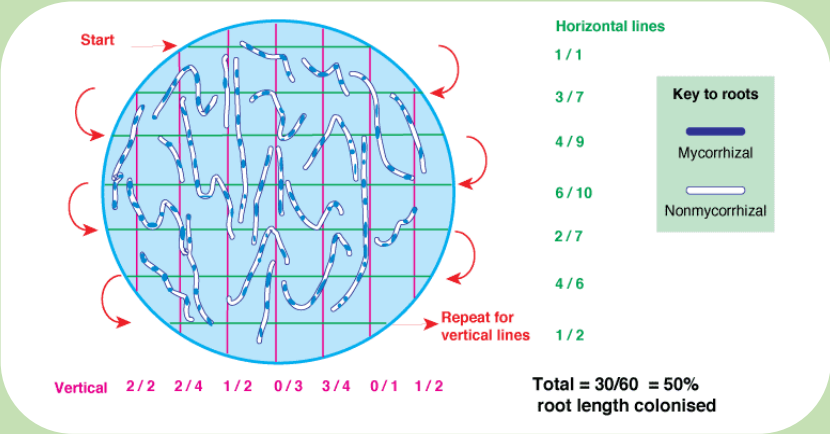
- **Three sample areas** were chosen based on the abundance of Garlic Mustard.
  - In each area **three transects 15 meters long and 5 meters apart** were established.
  - **15 soil samples were gathered from each sample site** using a soil corer

Methods cont.

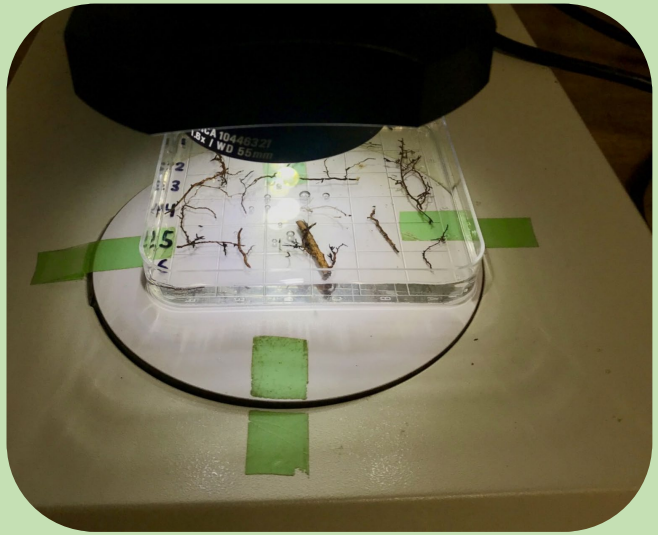
- The sites **differed in the amount of Garlic Mustard present**.
  - Control Site had **no history of having Garlic Mustard**
  - In the second site, **Garlic Mustard was present**.
  - In the third site, **Garlic Mustard was actively removed** (over a period of ten years).
    - This site is also in the process of restoration.

Methods cont.

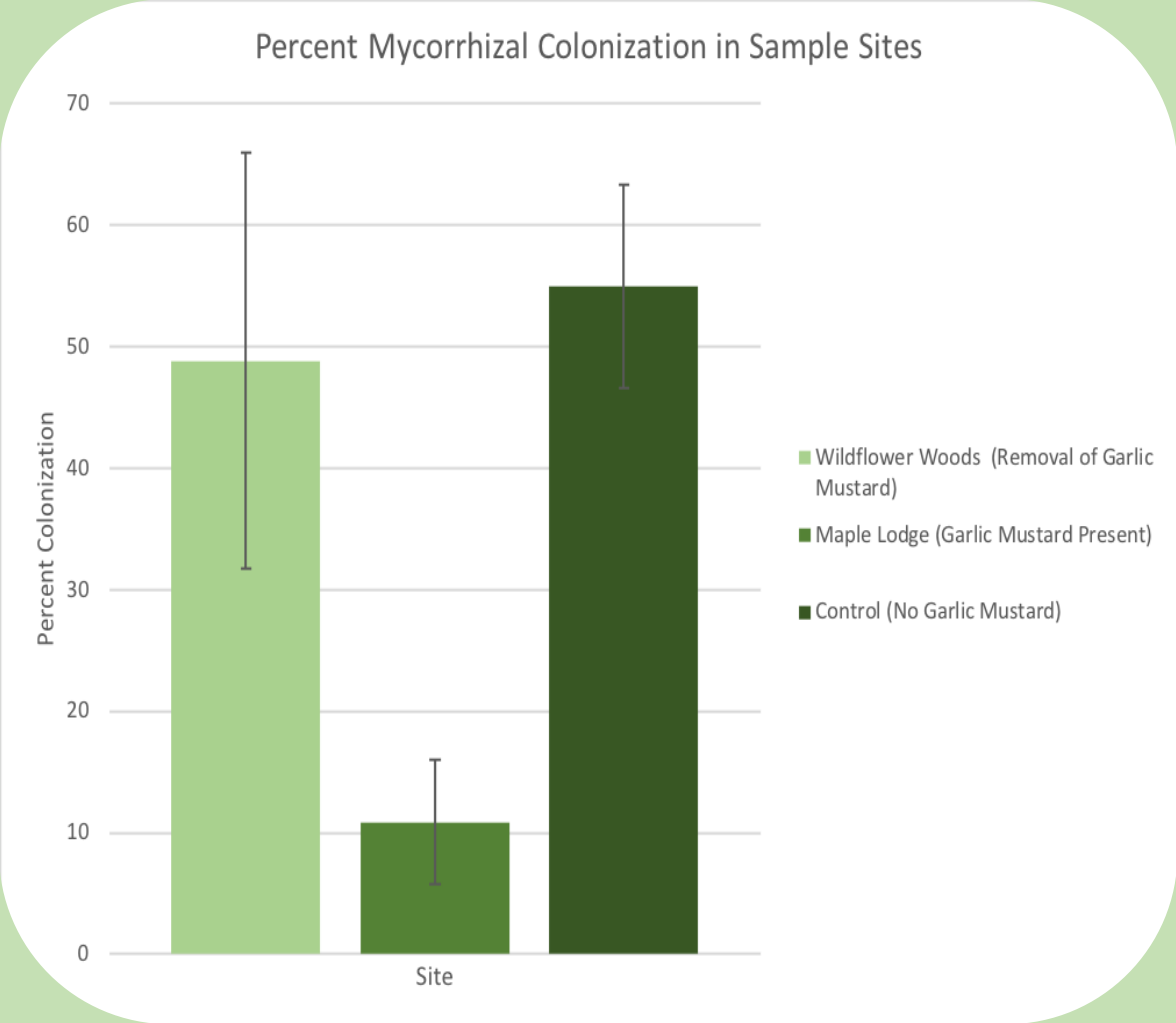
- Percent Colonization Methods



  - Soil Samples were **collected and washed**
  - A **clear petri dish was set up with a grid system** with labels for each column/row.
  - Rinsed **roots from the sample were put into the petri dish** with water.
  - A **dissecting microscope was used** to count the number of root tips that were colonized. This number was then used to create the percentage.



Results


Percent Mycorrhizal Colonization in Sample Sites
70
60
50
40
30
20
10
0
Percent Colonization
Site
Wildflower Woods (Removal of Garlic Mustard)
Maple Lodge (Garlic Mustard Present)
Control (No Garlic Mustard)


Biomass of Each Experimental Site
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Biomass (g)
Site
Wildflower Woods (Removal of Garlic Mustard)
Maple Lodge (Garlic Mustard Present)
Control (No Garlic Mustard)

Discussion

- Hypothesis was **supported**
  - A **greater percent colonization** was found in the sites where Garlic Mustard was either removed or not present.
  - Root Biomass was **greater** in areas without Garlic Mustard
- Garlic Mustard **negatively influences** percent colonization and root biomass

Discussion

- Removal of Garlic Mustard is likely a **feasible way to aid in forest regeneration**
  - In the site where Garlic Mustard was removed, the **percent colonization was only 10 percent less** than the control site
  - Compared to the site with Garlic Mustard, the site where Garlic mustard was removed had a **greater percentage of colonized roots**

Conclusion

- Garlic Mustard **negatively affects native plants**, their root systems, and percent mycorrhizal colonization
- Garlic Mustard also **negatively affects root biomass**
- Results support the assertion that **removal of Garlic Mustard aids in forest/plant regeneration**

Acknowledgements

I would like to thank Teatown, Amy Karpati, Charles Luisi, Eva Thaddeus, Erin Baker, Melissa Shandroff, and My Family

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