

# Aphid Avengers: Examining the Efficacy of the European Garlic Mustard Aphid (*Lipaphis alliariae*) as a Biocontrol for Garlic Mustard (*Alliaria petiolata*)

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## Background/Research Question

Garlic mustard is a biennial, invasive plant from Eurasia and lacks effective predators. Traditional methods of managing garlic mustard are expensive, time-consuming, and require ongoing effort. Finding an effective biological control is necessary and has been underway since 1998. The European garlic mustard aphid is a garlic mustard specialist first reported in North America in 2021 and causes wrinkled leaves and twisted seed pods.

**My research aims to examine the aphid's effectiveness as a biocontrol for garlic mustard by exploring population dynamics, their impact on seed and rosette development, and host-specificity.**

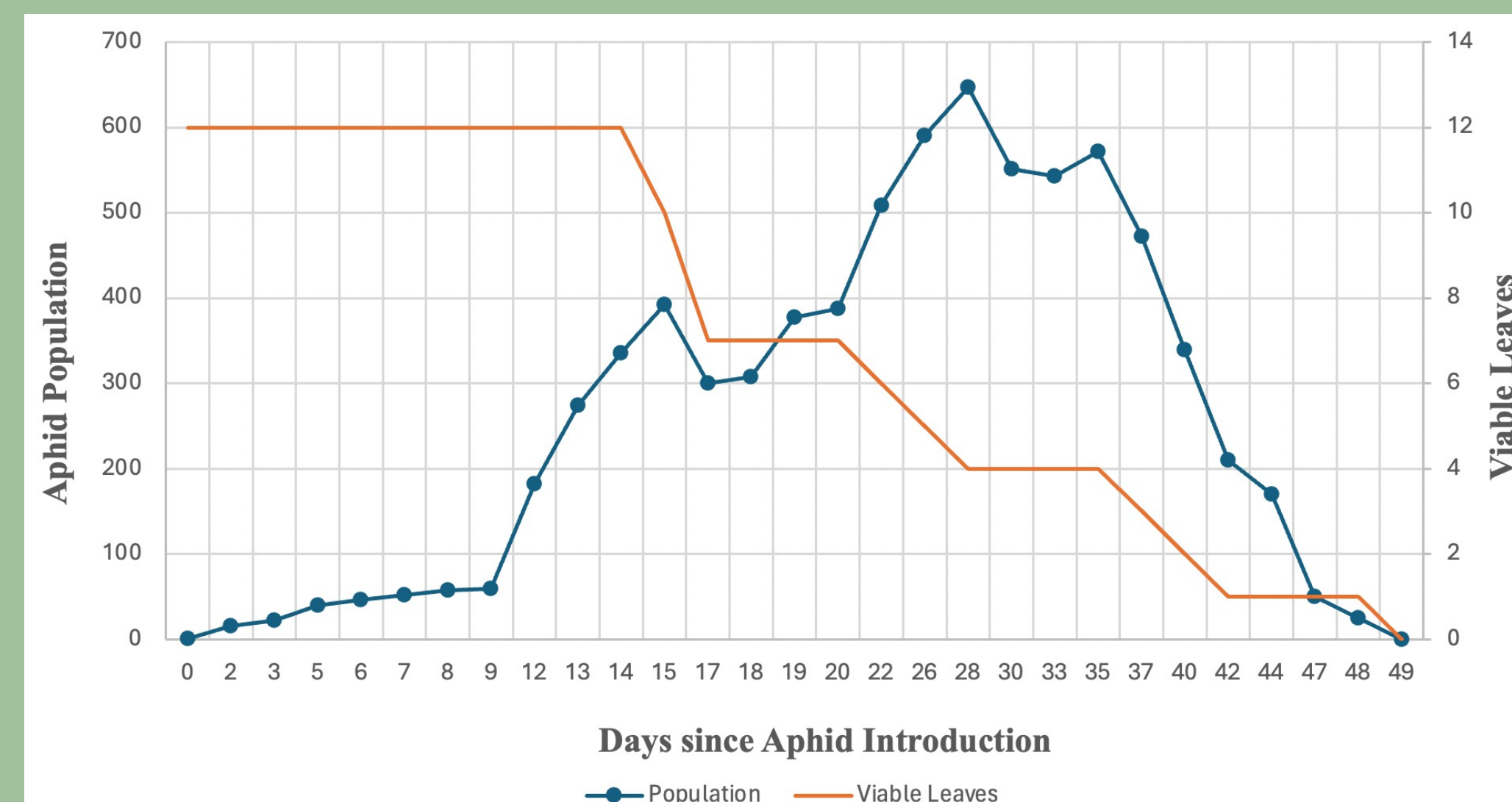
## Population Dynamics

### Methods:

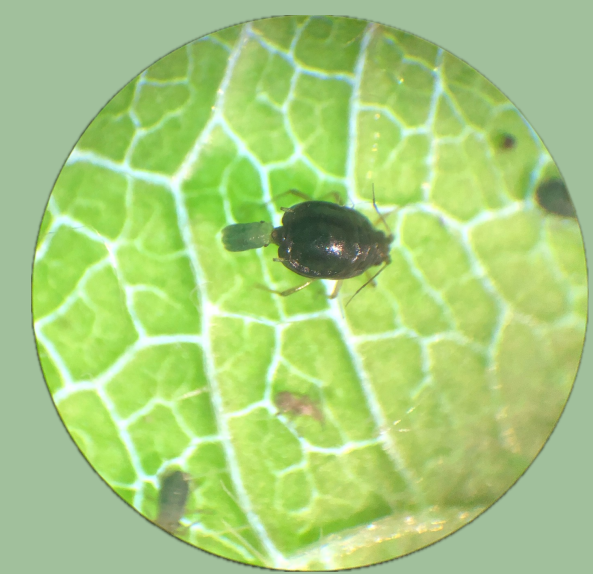
- Collected 2 rosettes and 1 aphid and placed them in a closed terrarium
- Counted aphid population over 7 weeks

### Results

- The population reached its peak of 647 aphids after 1 month on 2 rosettes
- 2 rosettes supported an aphid population for 49 days
- Aphids reached reproductive maturity after 9 days
- Adult aphids asexually produced ~6 live young in 1 day



Day 3



Asexual reproduction



Day 28

## Seed Production on Adult Plants

### Methods:

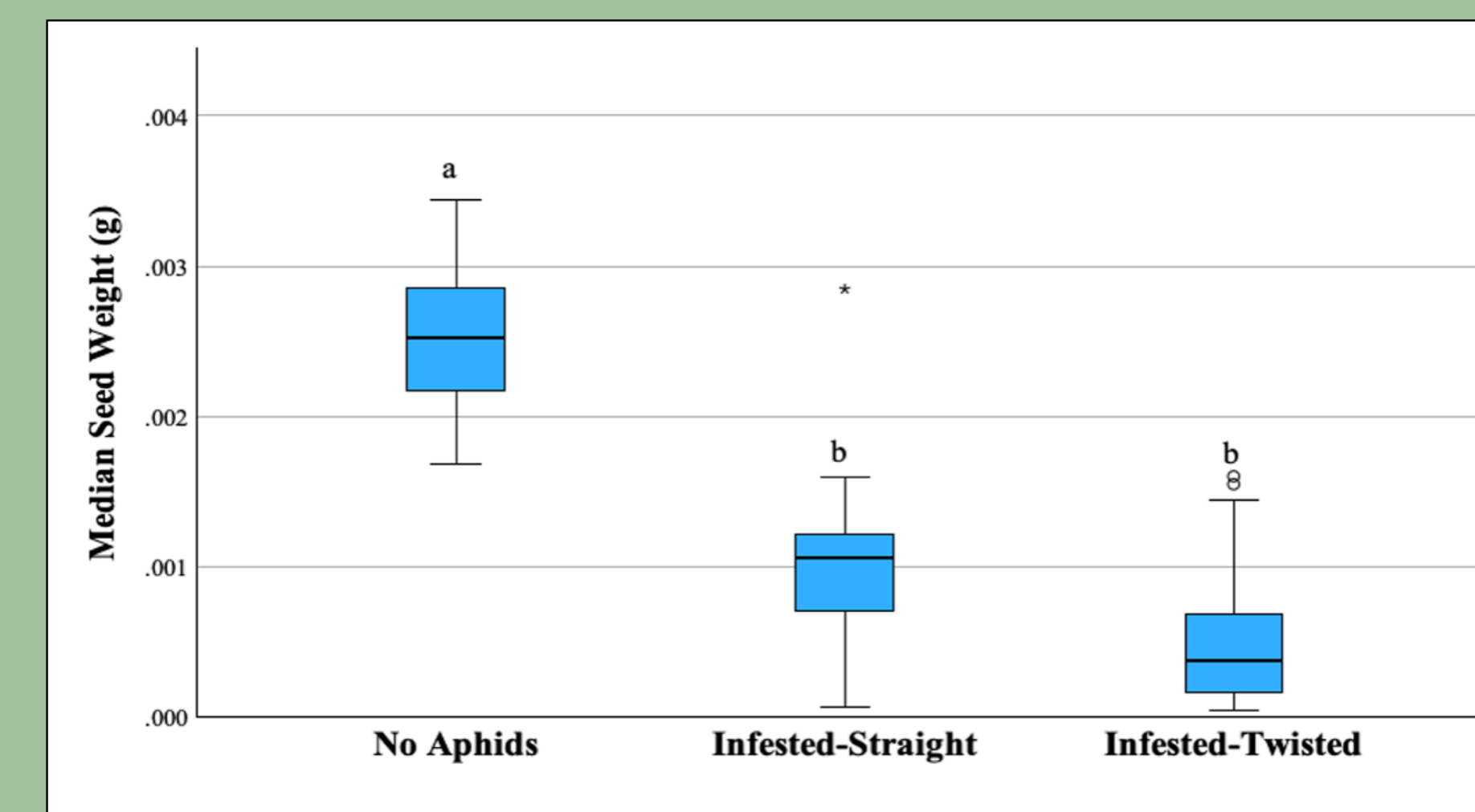
- Placed mesh bags on seed pods from plants with no aphids, aphid-infested plants with straight seed pods, and aphid-infested plants with twisted seed pods
- Removed bags after seed pods were dried
- Counted and weighed seeds in each individual pod
- Performed a float test to assess seed viability



Mesh bags on aphid-infested plant

### Results:

- Number of seeds were not significantly different between the 3 pod types
- The twisted seed pods naturally opened less and produced seeds that weighed significantly less and were less viable



## Rosette Development

### Methods:

- 20 rosettes were collected and randomly divided into treatment and control
- Collected initial data on stem height and stem count
- Infested each treatment rosette with 5 aphids
- Maintained both groups in identical conditions for 1 month
- Collected final measurements on stem height, stem count, GSW (stomatal conductance), and wet/dry biomass

### Results:

- The infestation of aphids:
- Reduced biomass (dry weight) by 68%
- Decreased height by 0.89cm
- Lowered stomatal conductance by 67%



Control plants (no aphids)



Treatment plants (aphids)

Rosettes after 1 month

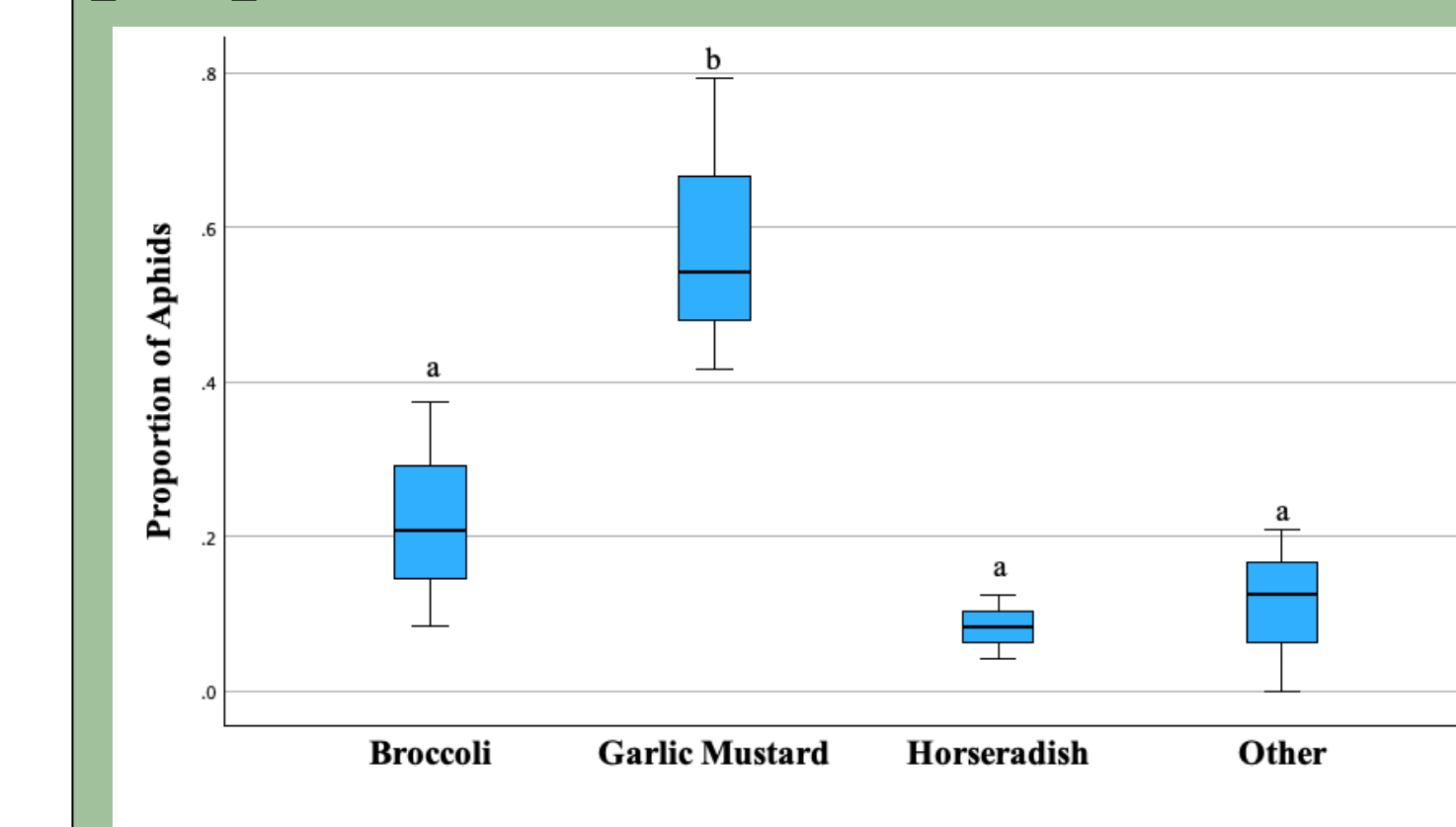
## Host-Specificity

### Methods:

- Placed 24 aphids on a center platform leading to 3 different Brassica plants- garlic mustard, broccoli, and horseradish
- Recorded aphid's choice after 24 hours and repeated the experiment 3 times with new aphids and plants

### Results:

- Garlic mustard had significantly higher aphid proportions



Host-specificity trial setup



Wrinkled garlic mustard leaves from aphid infestation



Aphid infestation on garlic mustard seed pods

## Future Research

- Conduct further host-specificity testing with native woodland understory plants
- Perform a real seed germination study
- Run additional host-specificity and rosette development trials
- Monitor aphid population and reproductive dynamics throughout an entire year

## Acknowledgments

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