The Self-Pollination of Amur Honeysuckle

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Abstract

Amur honeysuckle (*Lonicera maackii*) poses a dire threat to the health of forests throughout the eastern United States. While self-pollination has been identified as an important trait of invasive plant species, this trait is understudied, and Amur honeysuckle is anecdotally described as lacking this characteristic. To examine the ability of Amur honeysuckle to self-pollinate, we selected 171 individual shrubs distributed across 9 sites. We compared the number of berries, seeds per berry, and seed germination rates of self- and cross-pollinated flowers by pairing branches covered with pollination bags prior to flower emergence with uncovered branches on the same individual shrub. Out of 171 individuals, 48 produced self-pollinated berries within pollination bags (28%), with 48% of bagged branches exhibiting necrosis due to increased temperature and humidity. Self-pollinated berries produced 1.5 ± 1.4 (mean ± 1 SD) seeds per berry, whereas cross-pollinated berries produced 3.3 ± 1.5 seeds per berry. In a germination trial, 47.3% of self-pollinated seeds have germinated compared to 41.7% of cross-pollinated seeds. This study has shown that Amur honeysuckle can self-pollinate and set viable seed, providing the species with an important mechanism to increase population abundance during early stages of invasion.

Introduction

- Amur honeysuckle [*Lonicera maackii* (Rupr.) Herder] is a highly aggressive invasive shrub in eastern U.S. hardwood forests[1].
- While the ability to self-pollinate has been identified as a common trait in invasive plant species[2], Amur honeysuckle is consistently cited as not exhibiting this ability.
- However, many of these references are anecdotal or the source does not directly address the existence of the trait.
- A genetic study of outcrossing rates in Amur honeysuckle derived a self-pollination rate between 0.54 and 0.64%, leading the authors to conclude that Amur honeysuckle is likely self-incompatible[3].
- In this study, we directly tested whether Amur honeysuckle can self-pollinate and produce viable seed by comparing the number of berries, seeds per berry, and seed germination rates between self- and cross-pollinated flowers on 171 Amur honeysuckle individuals across nine sites in northwest Indiana.
- We predicted that while the overall seed set resulting from self-pollinated flowers may be small compared to cross-pollinated flowers, Amur honeysuckle will still be able to produce viable seed when cross-pollination is prevented.

Figure 1. A) Close-up view of a pollination bag attached to an Amur honeysuckle branch. B) The broad view of a bagged site with Dr. Jenkins for scale. C) Collection of mature berries at the end of the field trial.

Methods

- Amur honeysuckle individuals with abundant floral buds were selected haphazardly at 9 sites across different invasion types (heavy invasion, light invasion, and treated but re-established invasions) at Martell Forest and the Richard G. Lugar Forestry Farm in northwest Indiana.
- Prior to flower emergence (early May), pollination bags were places over branches to prevent cross-pollination. Control branches on the same individual were also selected and allowed to cross-pollinate.
- As berries were matured, and the number of berries per node (node is the area where two leaves and four flowers emerge from a branch) was recorded when pollination bags were removed for each branch (early September).
- As we collected the berries (late October), we counted the number of seeds per berry, then stratified seeds in a germination chamber based upon published protocols[4] and determined germination rates of self- and cross-pollinated seeds.

Results

1) Out of 171 individuals, 48 produced self-pollinated berries within pollination bags (28%).
2) Open-pollinated branches produced significantly more berries per node than self-pollinated branches.
   - t.test = t = -14.663, df = 171.78, p <0.001
3) Self-pollinated berries produced significantly fewer seeds per berry when compared to berries from open-pollinated flowers.
   - t.test: t = -5.721, df= 93.187, p < 0.001
4) The total germination rate did not differ between seeds from self-pollinated branches, as opposed to seeds from open-pollinated branches.
   - Chi-sq test: $\chi 2 = 1.906$, df = 1, p = 0.167

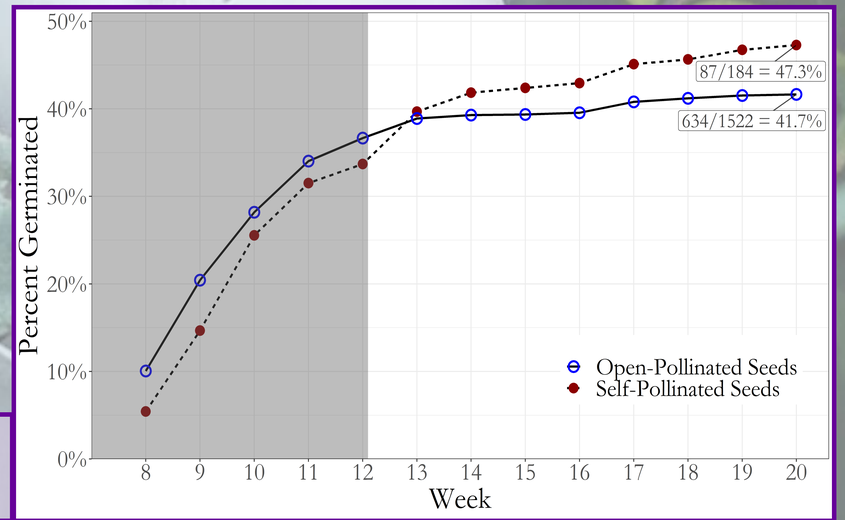

Figure 2. Percent germination of self- and open-pollinated seeds. Grey shaded area denotes germination during the stratification period.

Table I. Descriptive statistics comparing self- and open-pollinated branches, as well as from self-pollinated branches that produced one or more berries. A 'node' is a junction between two opposite leaves, where up to four flowers typically emerge.

	Self-Pollinated Branches						Open-Pollinated Branches					
	Berries		Berries Per Node		Seeds Per Berry		Berries		Berries Per Node		Seeds Per Berry	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
All Branches	0.75	1.70	0.01	0.03	1.53	1.40	19.65	17.11	0.50	0.43	3.25	1.54
Berry Producing Branches	2.69	2.27	0.05	0.04	1.53	1.40						

Discussion

- Amur honeysuckle clearly possesses the ability to self-pollinate and produce a viable seed set, which contradicts citations in the literature[3].
- While the overall reproductive rate would be lower for a self-pollinating individual isolated from other reproductive plants, considering the species' abundant flowering, it would still have the ability to establish a distal population without cross-pollination.
- Our results suggest that Amur honeysuckle is even more adept at invading new sites than previously described in the literature, which may impact how land-managers treat new invasions[1].

Literature Cited

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